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New records of ant species from Yunnan, China

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Abstract

As with many other regions of the world, significant collecting, curation, and taxonomic efforts will be needed to complete the inventory of China's ant fauna. This is especially true for the highly diverse tropical regions in the south of the country, where moist tropical forests harbor high species richness typical of the Southeast Asian region. We inventoried ants in the Xingshuangbanna prefecture, Yunnan, in June 2013, using a variety of methods including Winkler extraction and hand collection to sample ant diversity. We identified 213 species/morphospecies of ants from 10 subfamilies and 61 genera. After identification of 148 valid species of the 213 total species collected, 40 species represent new records for Yunnan province and 17 species are newly recorded for China. This increases the total number of named ant species in Yunnan and China to 447 and 951 respectively. The most common species collected were *Brachyponera luteipes* and *Vollenhovia emeryi*. Only one confirmed exotic species *Strumigenys membranifera*, was collected, although several others were potentially introduced by humans. These results highlight the high biodiversity value of the region, but also underscore how much work remains to fully document the native myrmecofauna.

Keywords

China, Formicidae, new records, Xishuangbanna, Yunnan

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Introduction

The understanding of regional and global patterns of insect diversity is limited by our incomplete accounting of Earth's species, especially for tropical regions where species richness peaks in most taxonomic groups. This is also true for Formicidae, an ecologically dominant insect family comprising at least 15,000 described species (Bolton 2014). Despite the ubiquity and ecological importance of ants (Hölldobler and Wilson 1990), many tropical regions remain undersampled even at the generic level (Guénard and Dunn 2012). Compiling and curating complete and accurate species checklists for all regions of the world should be a priority in biodiversity research, especially for diverse insect groups.

Towards that end, here we present the results of an ant survey conducted during the summer of 2013 in the area of Xishuangbanna, Yunnan Province, in the south of China. In particular, our goal here is to document new records of ant species detected in Yunnan, and some new records for China as a whole. The geographic location of Yunnan (ranging from 21.15°N to 29.20°N of latitude) and its topography (elevation range from < 100m to 6740m) render it the most diverse province of China in terms of ant diversity (406 species) (Guénard and Dunn 2012). The same is true for other taxa, such as plants (Li and Walker 1986, Mutke and Barthlott 2005), tiger beetles (Wu and Shook 2007), butterflies (Xie et al. 2009), or amphibians (Chen and Bi 2007). Xishuangbanna prefecture is located in the tropical southwestern region of Yunnan province, bordering Laos and Myanmar, and has been identified as the most diverse region of Yunnan (Long 1995). The ant fauna of Xishuangbanna has been the subject of three studies (Xu 1998, 1999, 2002) and new species are regularly described from this prefecture (e.g. Guénard et al. 2013, Xu et al. 2014a, b). According to Xu's survey (2002), the myrmecofauna of Xishuangbanna consists of approximately 262 species, which constitute about 65% of the total number of species recorded for Yunnan province.

While elements of China's ant fauna may be undocumented due to a lack of sampling in certain geographic regions, there are many taxa likely hidden in areas that have been sampled historically. In particular, methods targeting specifically subterranean or leaf litter ants have been rarely used in China, which as a result might bias our detection of ant species from specific strata. One of the most successful sampling techniques for collecting leaf litter ants, Winkler extraction, which is now commonly used for ant fauna surveys all over the world (Olson 1991, Fisher 1999, Agosti et al. 2000, Martelli et al. 2004, Vasconcelos and Lopes 2008, Ivanov and Keiper 2009), has only been used once in China (Hong Kong in Fellowes 1996) to the best of our knowledge. In this study we used Winkler extraction as a standardized collection technique for the first time in order to survey the leaf litter ant fauna of Xishuangbanna. Based predominantly on this highly successful sampling technique, our diversity survey revealed 40 new species records for Yunnan including 17 new records for China. Here we present those new records, as well as their known global distributions by using data information aggregated by the Global Ant BioInformatics project (GABI, Guénard et al. in prep).

Material and methods

Ant specimens were collected from primary forest, secondary forest and rubber plantation habitats near Menglun town, Xishuangbanna Prefecture, Yunnan Province, China during a survey in June 2013. Ants from leaf litter of multiple sites were collected and extracted by mini Winkler extractors for 72 hours using the shuffling method as described in Guénard and Lucky (2011). Ants were also collected by hand on the ground, lower vegetation, and tree trunks.

Samples were first sorted to morphospecies in alcohol, and up to three representatives of each morphospecies per sample were point-mounted. Each mounted specimen was assigned a unique specimen code, in this case a CASENT number, and traditional locality and collection labels. All mounted and alcohol-preserved ant specimens are currently located in EPE's lab at the Okinawa Institute of Science and Technology Graduate University. Extended depth of field specimen images were taken with an incorporated Leica DFC400 digital camera mounted on a Leica M205C stereomicroscope through the Leica Application Suite V4 software. All specimens were identified to genus using Bolton's key (Bolton 1994), and then identified to species using available keys (see results section) as well as the digital resources on AntWeb (http://www.antweb.org). All the specimen data are freely available on AntWeb.

Species distributions presented in the following maps are based on records reported here at the country level, or for the larger countries (China, India, Japan), at the first administration level. For large islands (e.g. Borneo, Sumatra, New Guinea) that form natural biogeographic units, we used the island boundary instead of political boundaries similar to a previous study (Guénard and Dunn 2012).

Results

Over 20000 specimens from 61 genera and 213 valid species and morphospecies were collected during this ant diversity survey (Table 1). A total of 40 new species records are presented for Yunnan province. Seventeen of these are recorded for the first time from China. The newly detected species belong to 15 genera from eight subfamilies. It is beyond the scope of the current paper to perform a comprehensive review/revision of the ant fauna of Yunnan Province, which would require much more geographically comprehensive sampling. Here, we present species accounts for the described ant species found during our survey that were previously unknown to Yunnan, supplementing other recently published checklists of the myrmecofauna of the region (Guénard and Dunn 2012).

Table 1. Ant species (Formicidae) collected from Xishuangbanna, Yunnan in 2013.

Species	Collection record[1]
Aenictinae	
Aenictus artipus Wilson, 1964	N*
Aenictus hodgsoni Forel, 1901	N
Aenictus maneerati Jaitrong & Yamane, 2013	N*
Aenictus paradentatus Jaitrong, Yamane & Tasen, 2012	N*
Aenictus thailandianus Terayama & Kubota, 1993	N
Aenictus clm01	
Aenictus clm04	
Amblyoponinae	
Bannapone scrobiceps Guénard, Blanchard, Liu, Yang & Economo, 2013	N*
Mystrium camillae Emery, 1889	
Cerapachyinae	
Cerapachys clm01	
Cerapachys sulcinodis Emery, 1889	
Cerapachys typhlus (Roger, 1861)	
Dolichoderinae	
Chronoxenus wroughtonii (Forel, 1985)	
Dolichoderus affinis Emery, 1889	
Dolichoderus laotius Santschi, 1920	N*
Dolichoderus squamanodus Xu, 2001	
Dolichoderus thoracicus (Smith, 1860)	
Iridomyrmex anceps (Roger, 1863)	
Tapinoma indicum Forel, 1895	
Tapinoma melanocephalum (Fabricius, 1793)	
Tapinoma clm04	
Technomyrmex albipes (Smith, 1861)	
Technomyrmex horni Forel, 1912	
Technomyrmex pratensis (Smith, 1860)	N
Ectatomminae	
Gnamptogenys costata (Emery, 1989)	N*
Gnamptogenys bicolor (Emery, 1989)	
Gnamptogenys treta Lattke, 2004	N*
Formicinae	
Acropyga nipponensis Terayama, 1985	
Anoplolepis gracilipes (Smith, 1857)	
Camponotus lasiselene Wang & Wu, 1994	
Camponotus mitis (Smith, 1858)	
Camponotus parius Emery, 1889	
Camponotus singularis Smith, 1858	
Camponotus clm02	
Camponotus clm03	
Camponotus clm04	
Camponotus clm07	
Camponotus clm08	

Species	**Collection record**[1]
Camponotus clm09	
Echinopla cherapunjiensis Bharti & Gul, 2012	N
Gesomyrmex kalshoveni Wheeler, W.M. 1929	N*
Lepisiota opaca (Forel, 1892)	
Lepisiota rothneyi (Forel, 1894)	
Myrmoteras binghamii Forel, 1893	
Myrmoteras cuneonodum Xu, 1998	
Nylanderia clm01	
Nylanderia clm02	
Nylanderia clm03	
Nylanderia clm04	
Nylanderia clm05	
Nylanderia clm06	
Oecophylla smaragdina (Fabricius, 1775)	
Paraparatrechina clm01	
Paraparatrechina clm02	
Paraparatrechina clm03	
Paraparatrechina clm04	
Plagiolepis clm01	
Polyrhachis armata (Le Guillou, 1842)	
Polyrhachis bicolor Mayr, 1862	
Polyrhachis bihamata (Drury, 1773)	
Polyrhachis furcata Emery, 1889	
Polyrhachis halidayi Emery, 1889	
Polyrhachis hippomanes Smith, 1861	
Polyrhachis illaudata Walker, 1859	
Polyrhachis illaudata pauperata Emery, 1889	
Prenolepis naoroji Forel, 1902	
Prenolepis sphingthoraxa Zhou & Zheng, 1998	N
Pseudolasius cibdelus Wu & Wang, 1992	
Pseudolasius emeryi Forel, 1915	
Pseudolasius silvestrii Wheeler, 1927	
Myrmicinae	
Acanthomyrmex luciolae Emery, 1893	
Aphaenogaster beccarii Emery, 1887	
Aphaenogaster feae Emery, 1889	
Aphaenogaster clm05	
Cardiocondyla wroughtonii (Forel, 1890)	
Carebara affinis (Jerdon, 1851)	
Carebara altinoda (Xu, 2003)	
Carebara bruni (Forel, 1913)	
Carebara diversa (Jerdon, 1851)	
Carebara melasolena (Zhou & Zheng, 1997)	N
Carebara clm01	
Carebara clm05	

Species	Collection record[1]
Carebara clm06	
Carebara clm07	
Carebara clm08	
Carebara clm09	
Carebara clm10	
Carebara clm11	
Carebara clm12	
Carebara clm13	
Cataulacus granulatus (Latreille, 1802)	
Crematogaster dohrni Mayr, 1879	
Crematogaster ferrarii Emery, 1888	
Crematogaster millardi Forel, 1902	
Crematogaster osakensis Forel, 1900	
Crematogaster politula Forel, 1902	
Crematogaster rothneyi Mayr, 1879	
Crematogaster clm05	
Crematogaster clm09	
Crematogaster clm10	
Crematogaster clm11	
Dilobocondyla fouqueti Santschi, 1910	
Kartidris ashima Xu & Zheng, 1995	
Lophomyrmex quadrispinosus (Jerdon, 1851)	
Lordomyrma idianale Taylor, 2012	
Meranoplus laeviventris Emery, 1889	
Monomorium chinense Santschi, 1925	
Monomorium pharaonis (Linnaeus, 1758)	
Monomorium clm01	
Monomorium clm02	
Monomorium clm05	
Monomorium clm06	
Myrmecina curvispina Zhou, Huang & Ma L., 2008	N
Myrmecina guangxiensis Zhou, 2001	N
Pheidole hongkongensis Wheeler, 1928	N
Pheidole noda Smith, 1874	
Pheidole pieli Santschi, 1925	
Pheidole plagiaria Smith, 1860	N
Pheidole planifrons Santschi, 1920	N
Pheidole roberti Forel, 1902	
Pheidole rugithorax Eguchi, 2008	N
Pheidole sagei Forel, 1902	
Pheidole smythiesii Forel, 1902	N
Pheidole tumida Eguchi, 2008	N
Pheidole vieti Eguchi, 2008	N*
Pheidole zoceana Santschi, 1925	N
Pheidole clm03	

Species	Collection record[1]
Pheidole clm04	
Pheidole clm07	
Pheidole clm12	
Pheidole clm13	
Pheidole clm16	
Pheidole clm18	
Pheidole clm22	
Pheidole clm13	
Pristomyrmex brevispinosus Emery, 1887	
Pristomyrmex hamatus Xu & Zhang, 2002	
Pristomyrmex punctatus (Smith, 1860)	
Recurvidris recurvispinosa (Forel, 1890)	
Recurvidris kemneri (Wheeler & Wheeler, 1954)	N*
Solenopsis jacoti Wheeler, 1923	
Strumigenys ailaoshana (Xu & Zhou, 2004)	
Strumigenys dyschima (Bolton, 2000)	N*
Strumigenys exilirhina Bolton, 2000	
Strumigenys feae Emery, 1895	
Strumigenys kichijo (Terayama, Lin & Wu, 1996)	N
Strumigenys lyroessa (Roger, 1862)	
Strumigenys membranifera Emery, 1869	
Strumigenys mitis (Brown, 2000)	N
Strumigenys mutica (Brown, 1949)	
Strumigenys nanzanensis Lin & Wu, 1996	
Strumigenys nepalensis Baroni Urbani & De Andrade, 1994	N*
Strumigenys rallarhina Bolton, 2000	N
Strumigenys sauteri (Forel, 1912)	N
Tetramorium aptum Bolton, 1977	
Tetramorium ciliatum Bolton, 1977	
Tetramorium difficile Bolton, 1977	N*
Tetramorium flavipes Emery, 1893	N*
Tetramorium kheperra (Bolton, 1976)	
Tetramorium kraepelini Forel, 1905	
Tetramorium nipponense Wheeler, 1928	
Tetramorium parvispinum (Emery, 1893)	N
Tetramorium polymorphum Yamane & Jaitrong, 2011	N*
Tetramorium tonganum Mayr, 1870	N
Tetramorium clm03	
Tetramorium clm10	
Tetramorium clm18	
Tetramorium clm19	
Vollenhovia emeryi Wheeler, 1906	
Ponerinae	
Anochetus graeffei Mayr, 1870	
Anochetus mixtus Radchenko, 1993	

Species	Collection record[1]
Anochetus myops Emery, 1893	
Anochetus clm04	
Brachyponera luteipes (Mayr, 1862)	
Diacamma clm01	
Ectomomyrmex astutus (Smith, 1858)	
Ectomomyrmex leeuwenhoeki (Forel, 1886)	
Ectomomyrmex lobocarenus (Xu, 1995)	
Ectomomyrmex clm01	
Ectomomyrmex clm02	
Ectomomyrmex clm03	
Ectomomyrmex clm04	
Emeryopone melaina Xu, 1998	
Hypoponera clm01	
Hypoponera clm02	
Hypoponera clm03	
Hypoponera clm04	
Hypoponera clm05	
Hypoponera clm06	
Hypoponera clm07	
Leptogenys birmana Forel, 1900	
Leptogenys chinensis (Mayr, 1870)	
Leptogenys crassicornis Emery, 1895	
Leptogenys diminuta (Smith, 1857)	
Leptogenys lucidula Emery, 1895	
Leptogenys mengzii Xu, 2000	
Leptogenys clm01	
Leptogenys clm02	
Leptogenys clm09	
Myopias hania Xu & Liu, 2011	
Odontomachus clm01	
Odontoponera denticulata (Smith, 1858)	N
Platythyrea parallela (Smith, 1859)	
Pseudoneoponera rufipes (Forel, 1911)	
Proceratinae	
Discothyrea clavicornis Emery, 1897	N*
Discothyrea kamiteta Kubota & Terayama, 1999	N
Probolomyrmex longiscapus Xu & Zeng, 2000	
Proceratium deelemani Perrault, 1981	N*
Pseudomyrmecinae	
Tetraponera amargina Xu & Chai, 2004	
Tetraponera allaborans (Walker, 1859)	
Tetraponera attenuata Smith, 1877	
Tetraponera concava Xu & Chai, 2004	

[1] N = New to Yunnan province; N* = New to China.

Species accounts

Aenictus artipus Wilson, 1964

Figure 1

Material examined. CHINA, Yunnan, Xishuangbanna: Man Sai village (21.858°N, 101.277°E), Rubber plantation, 12.vi.2013, 5 workers, 705m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Secondary forest, 12.vi.2013, 18 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record), Vietnam and Thailand (Figure 1C). This collection represents the northern-most record of *Aenictus artipus*.

Taxonomic note. *Aenictus artipus* belongs to the *Aenictus wroughtonii* species group and can be easily identified with the identification key provided by Jaitrong et al. (2010).

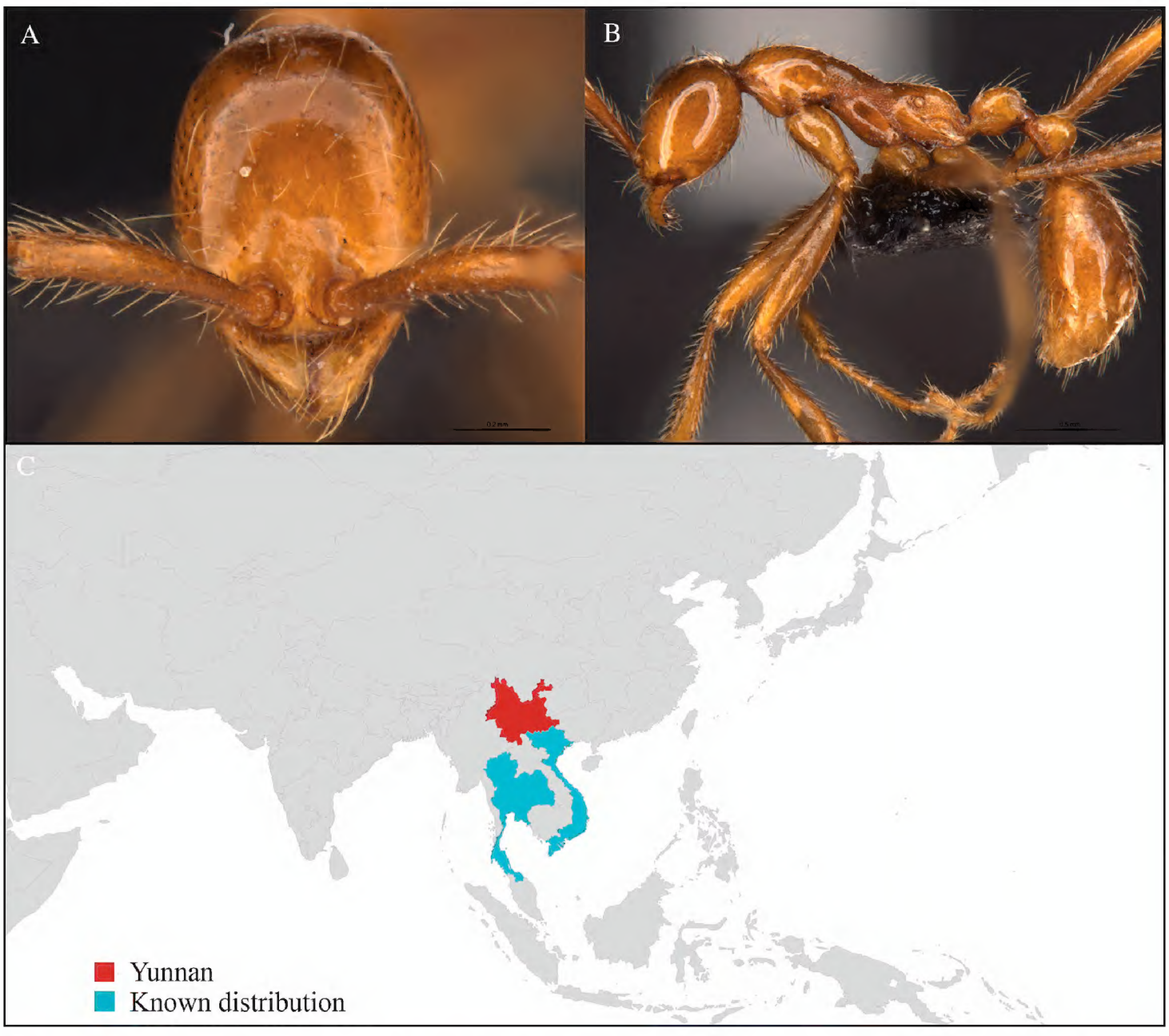

Figure 1. *Aenictus artipus* worker, CASENT0717199. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Natural history. *Aenictus artipus* has been collected from leaf litter in various habitats such as secondary forest and rubber plantation located near natural secondary forest. In addition, *A. artipus* has also been found in different habitats such as montane evergreen forest, savanna forest, evergreen forest and disturbed forest (Jaitrong et al. 2010).

Aenictus hodgsoni Forel, 1901

Figure 2

Material examined. CHINA, Yunnan, Xishuangbanna: Xishuangbanna Tropical Botanical Garden (known as 'XTBG') (21.919°N, 101.270°E), Secondary forest, 08.vi.2013, 12 workers, 610m, Hand collection, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 40 workers, 825m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

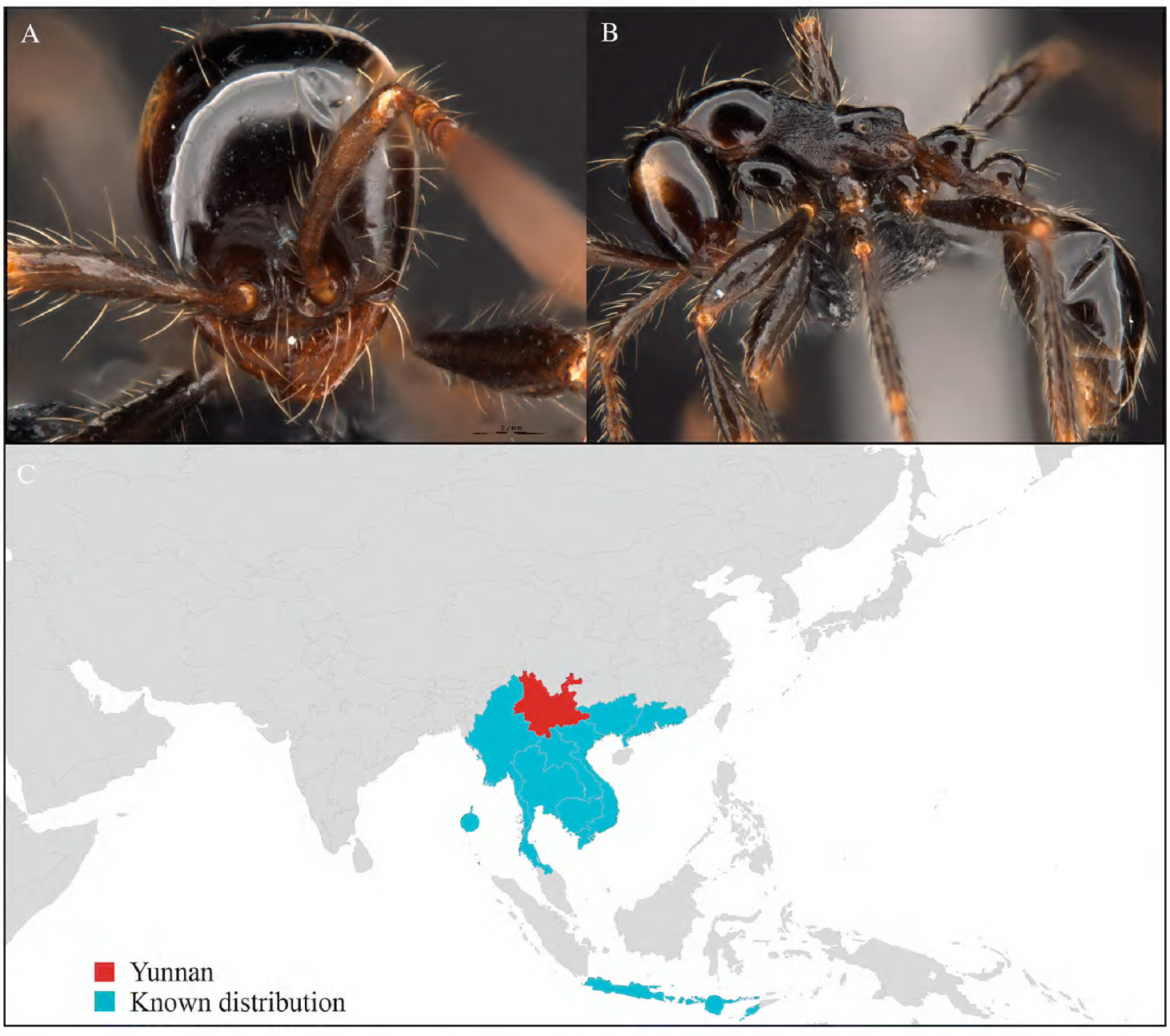

Figure 2. *Aenictus hodgsoni* worker, CASENT0716190. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Widely distributed in the Indo-Malayan subregions (Figure 2C).

Taxonomic note. *Aenictus hodgsoni* belongs to the *Aenictus laevicepss* species group and can be easily identified with the identification key provided by Jaitrong and Yamane (2011).

Natural history. *Aenictus hodgsoni* has been collected from leaf litter and foraging columns on the forest ground in secondary forest. This species has also been found from lowland to highland in varied forest types (hill evergreen forest, dry evergreen forest, evergreen rain forest, mixed deciduous forest, and savanna) (Jaitrong and Yamane 2011).

Aenictus maneerati Jaitrong & Yamane, 2013

Figure 3

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.916°N, 101.274°E), Secondary forest, 08.vi.2013, 1 worker, 615m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

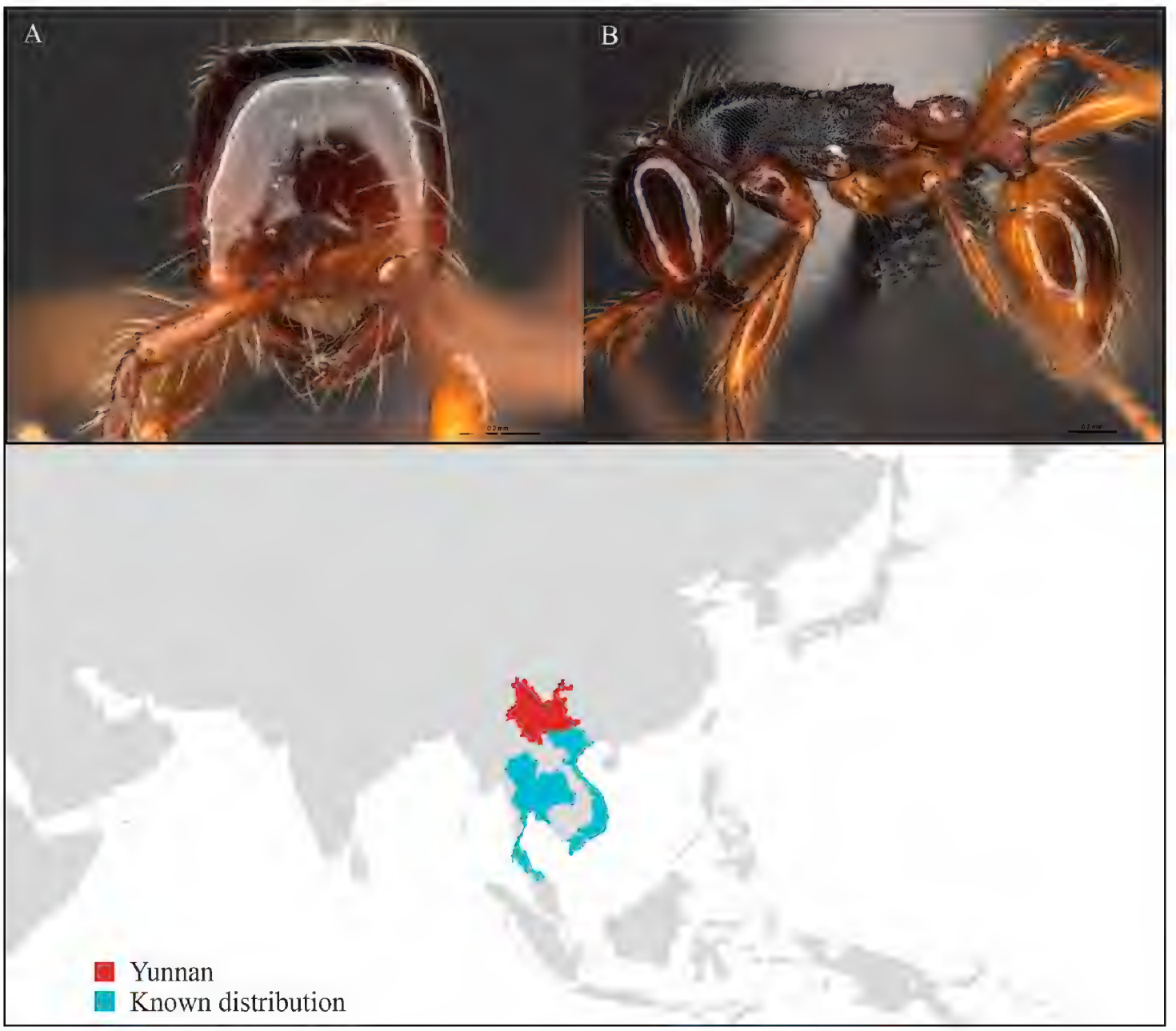

Figure 3. *Aenictus maneerati* worker, CASENT0717211. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Yunnan (new record), Vietnam and Thailand (Figure 3C). Our material represents the northern-most record of *Aenictus hodgsoni*.

Taxonomic note. *Aenictus hodgsoni* belongs to the *Aenictus ceylonicus* species group and can be easily identified with the identification key provided by Jaitrong and Yamane (2013).

Natural history. Little is known about the bionomics of *Aenictus hodgsoni*. Before our survey, it has been only collected from primary forest (Jaitrong and Yamane 2013). We collected it from leaf litter in secondary forest.

Aenictus paradentatus Jaitrong, Yamane & Tasen, 2012

Figure 4

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.911°N, 101.281°E), Limestone forest, 06.vi.2013, 46 workers, 655m, Hand collection, B. Guénard, B. Blanchard and C. Liu.

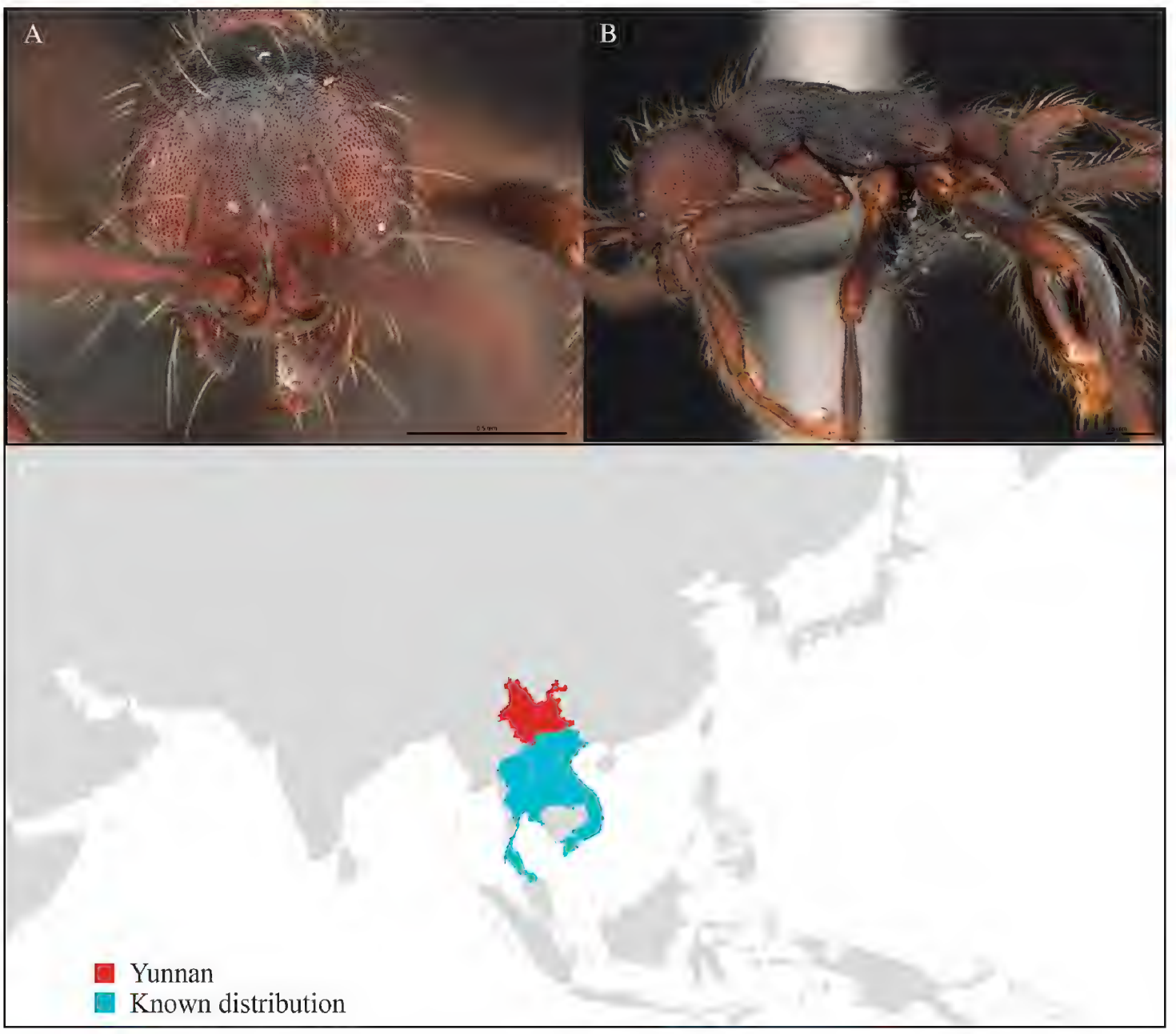

Figure 4. *Aenictus paradentatus* worker, CASENT0716195. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Yunnan (new record), Vietnam, Laos, and Thailand (Figure 4C). This collection represents the northern-most record of *Aenictus paradentatus*.

Taxonomic note. *Aenictus paradentatus* is very similar to *Aenictus dentatus* Forel, 1911, and can be easily identified with the key of Jaitrong et al. (2012).

Natural history. *Aenictus paradentatus* has been collected from foraging columns on the ground in limestone forest, but was also reported to be found in other forest habitats, ranging from primary forest to disturbed forest (Jaitrong et al. 2012).

Aenictus thailandianus Terayama & Kubota, 1993

Figure 5

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.274°E), Secondary forest, 11.vi.2013, 19 workers, 590m, Hand collection, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.857°N, 101.277°E), Rubber

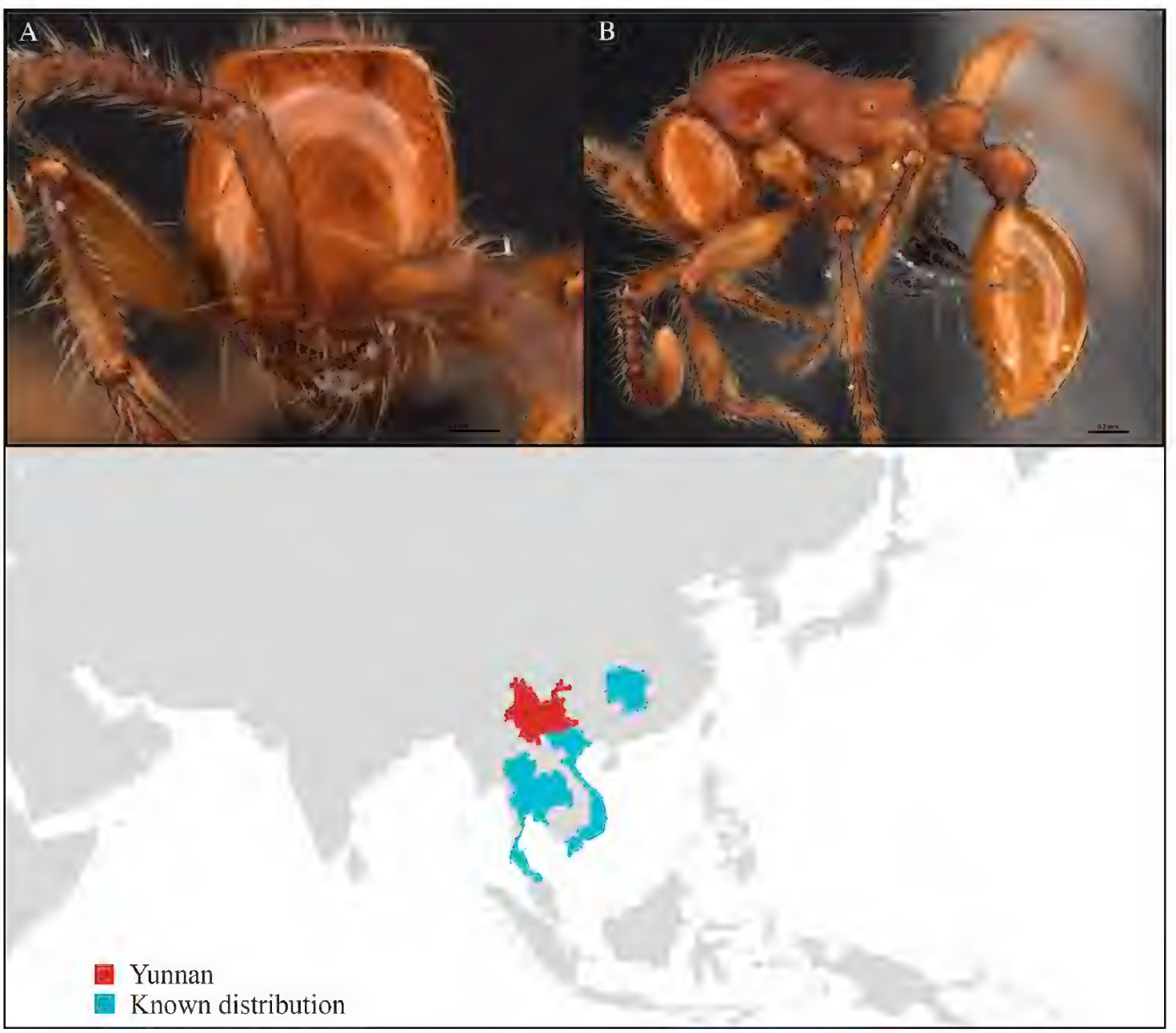

Figure 5. *Aenictus thailandianus* worker, CASENT0717202. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

plantation, 12.vi.2013, 19 workers, 680m, Hand collection, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.857°N, 101.277°E), Rubber plantation, 12.vi.2013, 254 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record), Hunan, Vietnam and Thailand (Figure 5C).

Taxonomic note. *Aenictus thailandianus* belongs to the *Aenictus ceylonicus* species group and can be easily identified with the identification key presented by Jaitrong and Yamane (2013).

Natural history. *Aenictus thailandianus* has only been found at higher elevations (1000–1500m) in primary and secondary forest (Jaitrong and Yamane 2013). We collected it from leaf litter and foraging columns on the ground in secondary forest and rubber plantations at lower elevations (under 1000m).

Bannapone scrobiceps Guénard, Blanchard, Liu, Yang & Economo, 2013

Figure 6

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 2 workers, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record) (Figure 6C).

Taxonomic note. *Bannapone scrobiceps* was described recently (Guénard et al. 2013).

Natural history. Little is known about the bionomics of *Bannapone scrobiceps*. The species was collected from leaf litter in secondary forest located at 550 meters elevation (Guénard et al. 2013).

Carebara melasolena (Zhou & Zheng, 1997)

Figure 7

Material examined. CHINA, Yunnan, Xishuangbanna: Kilometer 55 station (21.960°N, 101.199°E), Rain forest, 10.vi.2013, 23 workers, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in Middle and South China (Figure 7C).

Taxonomic note. *Carebara melasolena* can be identified with the key provided by Zhou and Zheng (1997; treated as *Pheidologeton melasolenus*)

Natural history. *Carebara melasolena* has been collected from leaf litter in primary forest.

Discothyrea clavicornis Emery, 1897

Figure 8

Material examined. CHINA, Yunnan, Xishuangbanna: Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 10.vi.2013, 1 worker, 830m, Winkler sifting, B. Guénard,

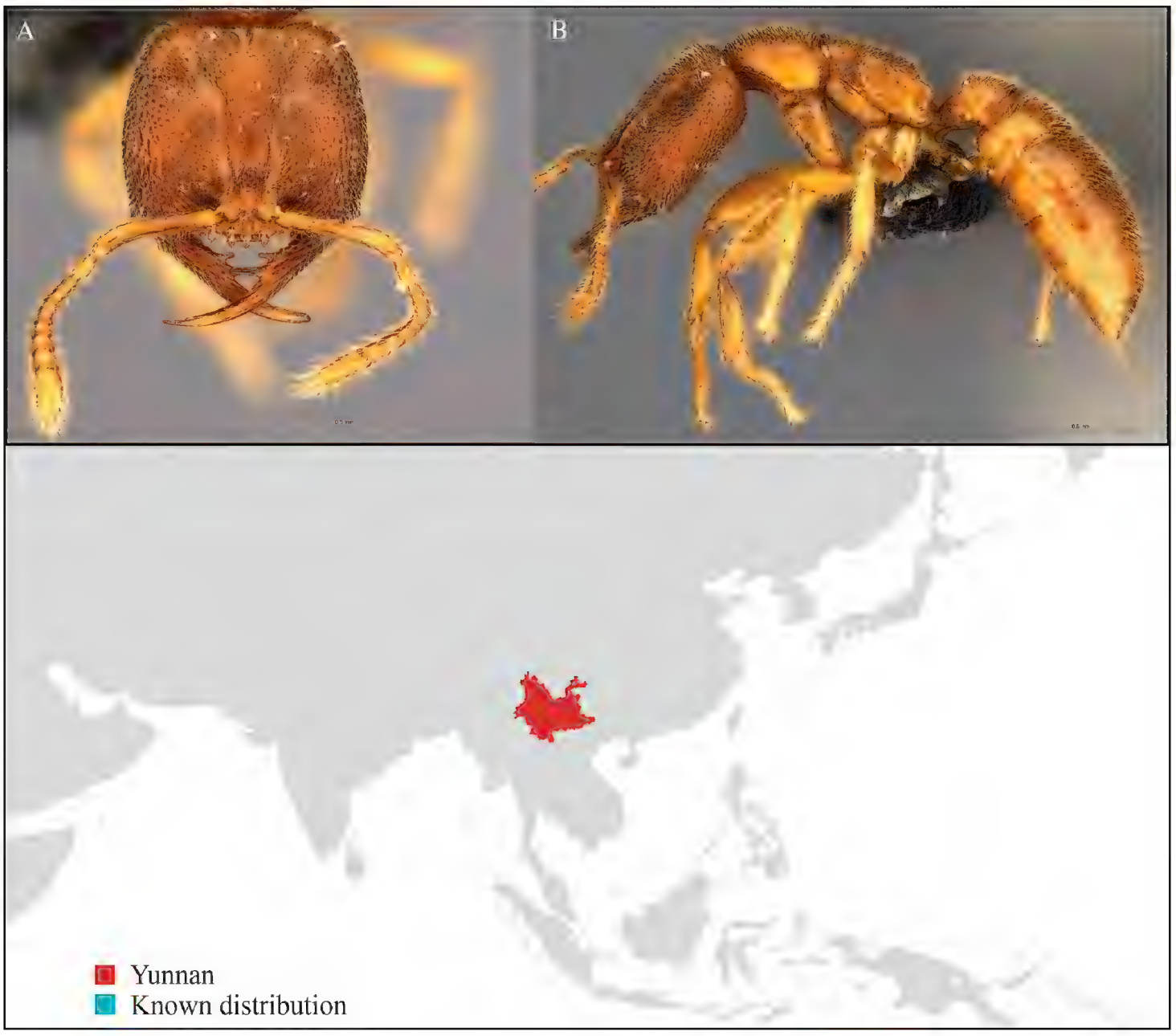

Figure 6. *Bannapone scrobiceps* worker, CASENT0339957. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 8 workers, 805m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.201°E), Rain forest, 13.vi.2013, 1 worker, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.964°N, 101.202°E), Rain forest, 13.vi.2013, 3 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.270°E), Rubber plantation, 09.vi.2013, 12 workers, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 6 worker, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.285°E), Limestone forest, 06.vi.2013, 3 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Limestone forest, 05.vi.2013, 15 workers, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.284°E), Limestone forest, 06.vi.2013, 1 worker, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.918°N, 101.271°E), Rain forest, 05.vi.2013, 3 workers, 581m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.281°E),

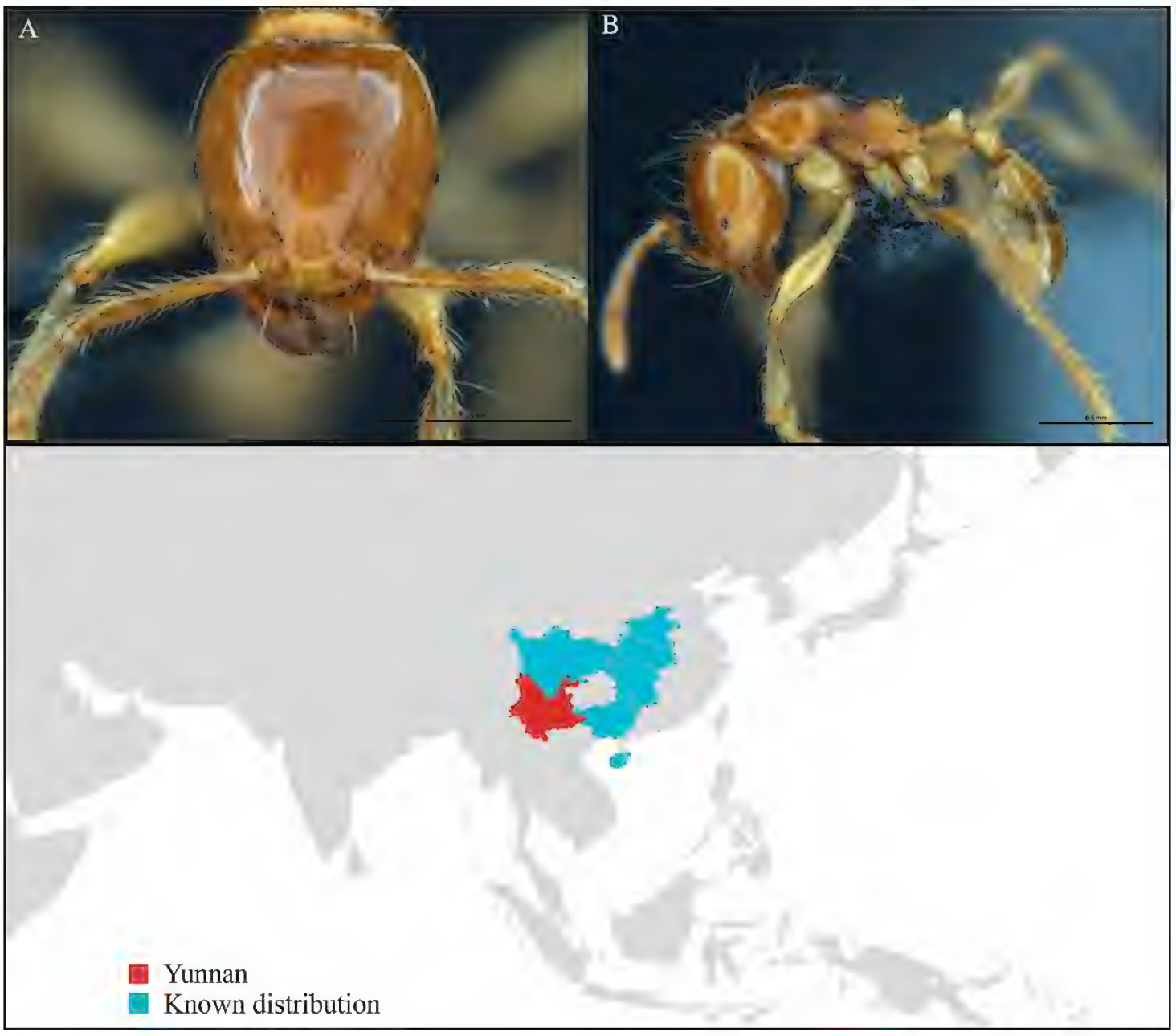

Figure 7. *Carebara melasolena* worker, CASENT0714818. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Limestone forest, 05.vi.2013, 1 worker, 650m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.916°N, 101.274°E), Rain forest, 08.vi.2013, 3 workers, 615m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Rain forest, 08.vi.2013, 2 workers, 625m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.922°N, 101.268°E), Rubber plantation, 14.vi.2013, 3 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. *Discothyrea clavicornis* is a very widespread and common species encountered throughout most of the Austral-Asian and Indo-Malayan subregions (Figure 8C). This new record represents an important extension of the northern range in the distribution of this species.

Taxonomic note. There is no available key for *Discothyrea clavicornis*. Our identification is based on the original description (Emery 1897), comparison with reference material, and montage images of the holotype provided by AntWeb.

Natural history. *Discothyrea clavicornis* has been collected from leaf litter in various habitats such as primary forest, limestone forest and rubber plantation.

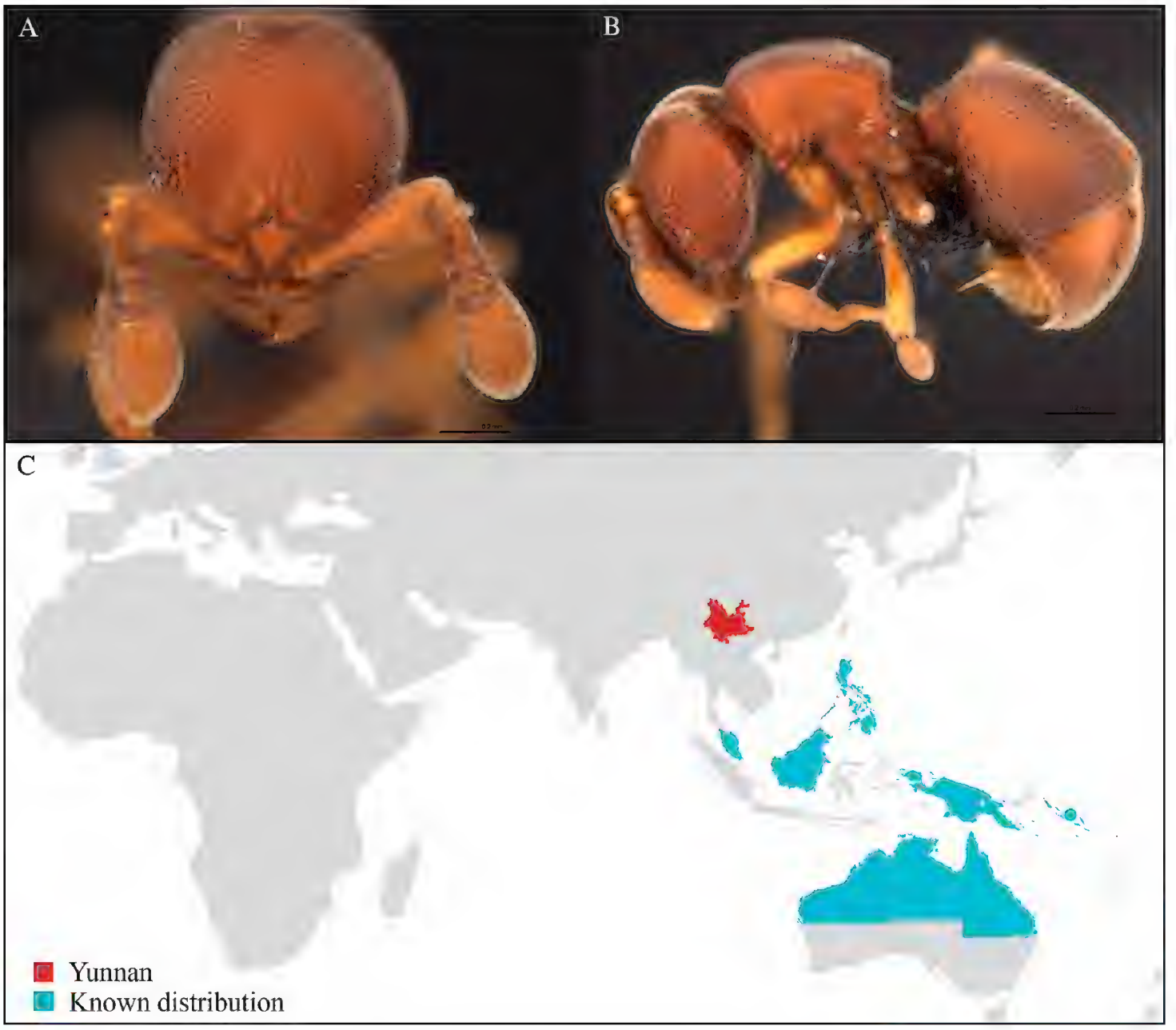

Figure 8. *Discothyrea clavicornis* worker, CASENT0735814. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Discothyrea kamiteta Kubota & Terayama, 1999

Figure 9

Material examined. CHINA, Yunnan, Xishuangbanna: Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 1 worker, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.283°E), Limestone forest, 06.vi.2013, 1 worker, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Secondary forest, 08.vi.2013, 1 worker, 625m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 1 worker, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record), Hunan, Okinawa (Figure 9C). This new record represents an important western-most extension in the known distribution of this species.

Taxonomic note. *Discothyrea kamiteta* is very similar to the recently described *Discothyrea banna* Xu, Burwell & Nakamura, 2014. Both species seem to be very close

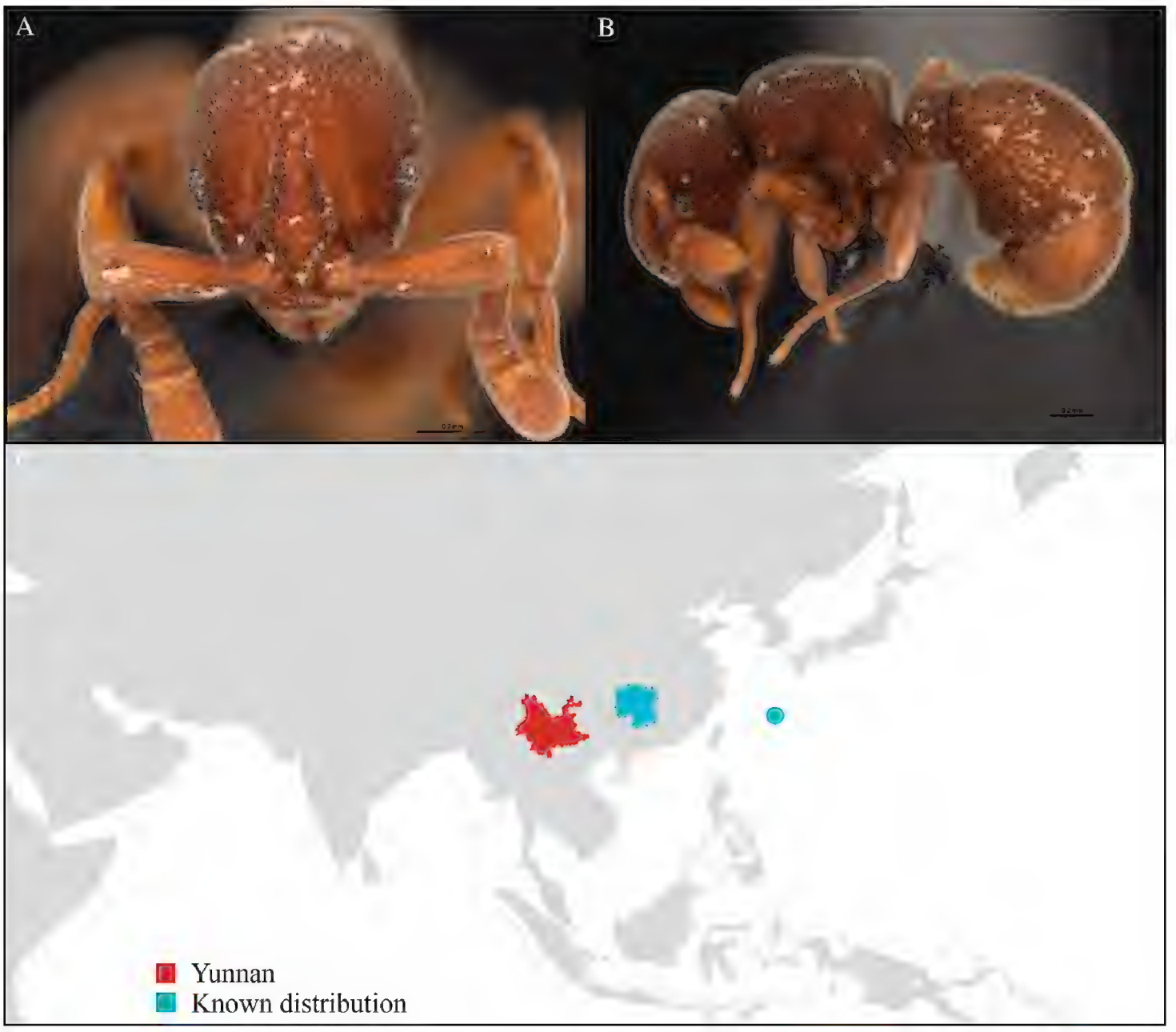

Figure 9. *Discothyrea kamiteta* worker, CASENT0717828. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

morphologically, and their separation is based on minor differences, which could also be attributed to intraspecific variation. The identification is based on the original description of *D. kamiteta*, comparison with *D. kamiteta* material from the type locality (Okinawa), and Xu's key (Xu et al. 2014)

Natural history. *Discothyrea kamiteta* has been collected from leaf litter in various habitats, such as primary forest, limestone forest and secondary forest.

Dolichoderus laotius Santschi, 1920

Figure 10

Material examined. CHINA, Yunnan, Xishuangbanna: Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 5 worker, 690m, Hand collection, B. Guénard, B. Blanchard and C. Liu.

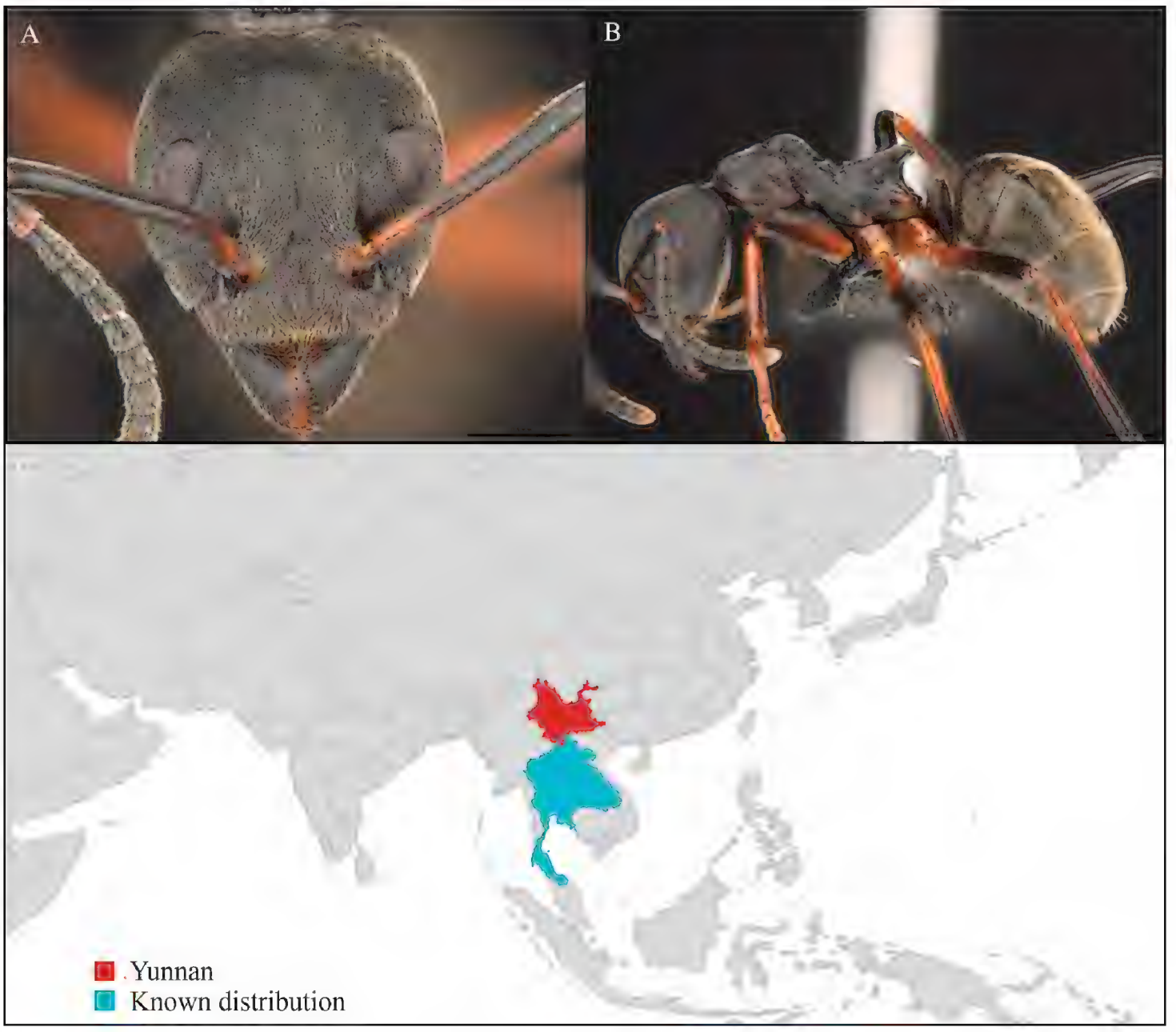

Figure 10. *Dolichoderus laotius* worker, CASENT0716164. **A** Head in front view **B** Alitrunk in profile view **C** Global distribution map.

Distribution. Yunnan (new record), Laos, Thailand (Figure 10C). This collection represents the northern-most record of *Dolichoderus laotius* .

Taxonomic note. There is no available key for the genus in the region. Our identification is based on the description provided by Dill et al. (2002).

Natural history. Little is known about the bionomics of *Dolichoderus laotius* . This species has been collected on a tree trunk in secondary forest.

Echinopla cherapunjiensis Bharti & Gul, 2012

Figure 11

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.273°E), Secondary forest, 08.vi.2013, 1 worker, 615m, Hand collection, B. Guénard, B. Blanchard and C. Liu.

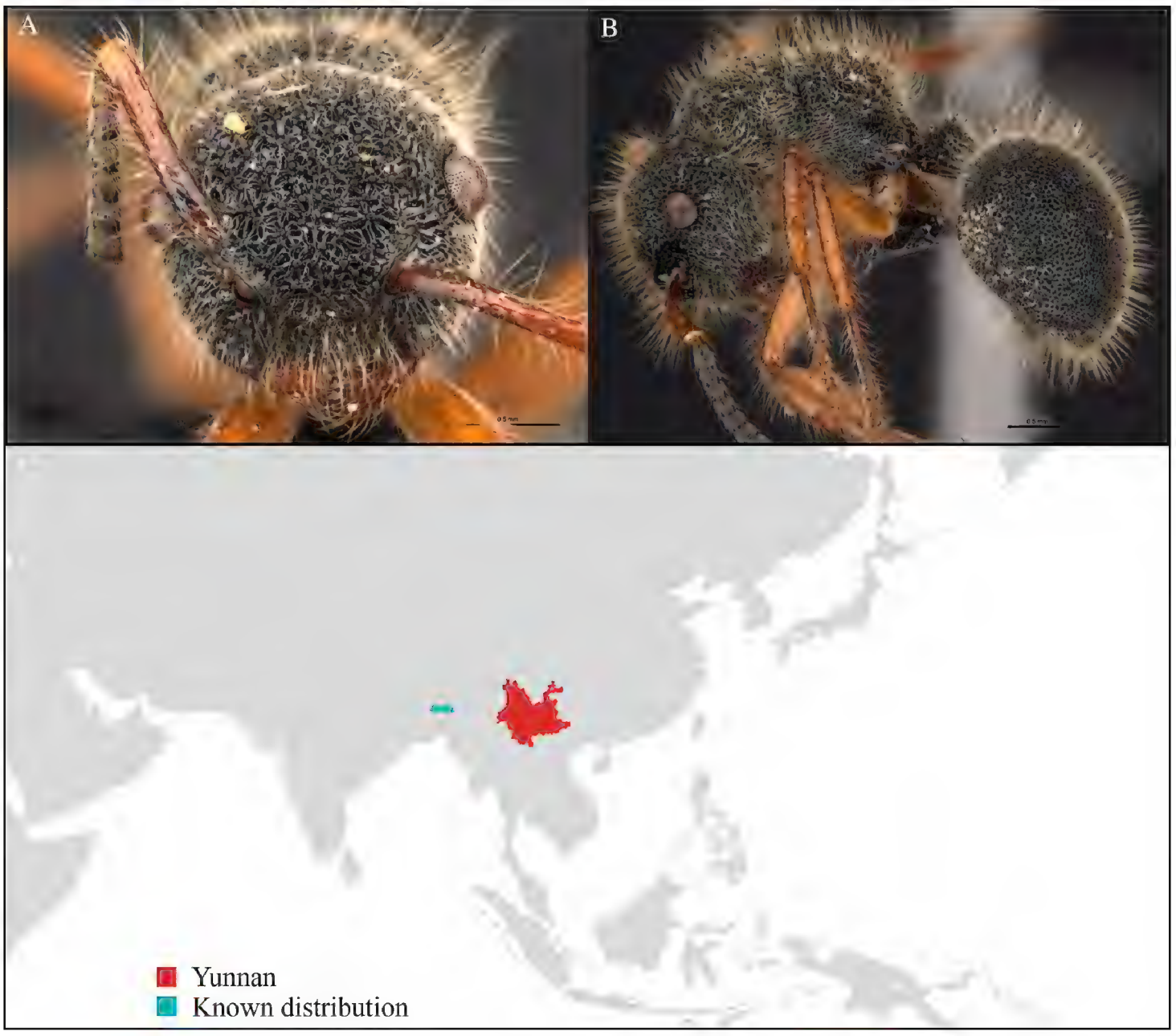

Figure 11. *Echinopla cherapunjiensis* worker, CASENT0716524. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Yunnan (new record) and Meghalaya (Figure 11C). This new record represents an important northern and western extension in the distribution of *Echinopla cherapunjiensis*.

Taxonomic note. There is no available key for this genus. Identification is based on the original description (Bharti and Gul 2012).

Natural history. Little is known about the bionomics of *Echinopla cherapunjiensis*. This species has been collected on a tree trunk in secondary forest.

Gesomyrmex kalshoveni Wheeler, 1929

Figure 12

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.925°N, 101.270°E), Forest fragment, 08.vi.2013, 1 worker, 615m, Hand collection, B. Guénard, B. Blanchard and C. Liu.

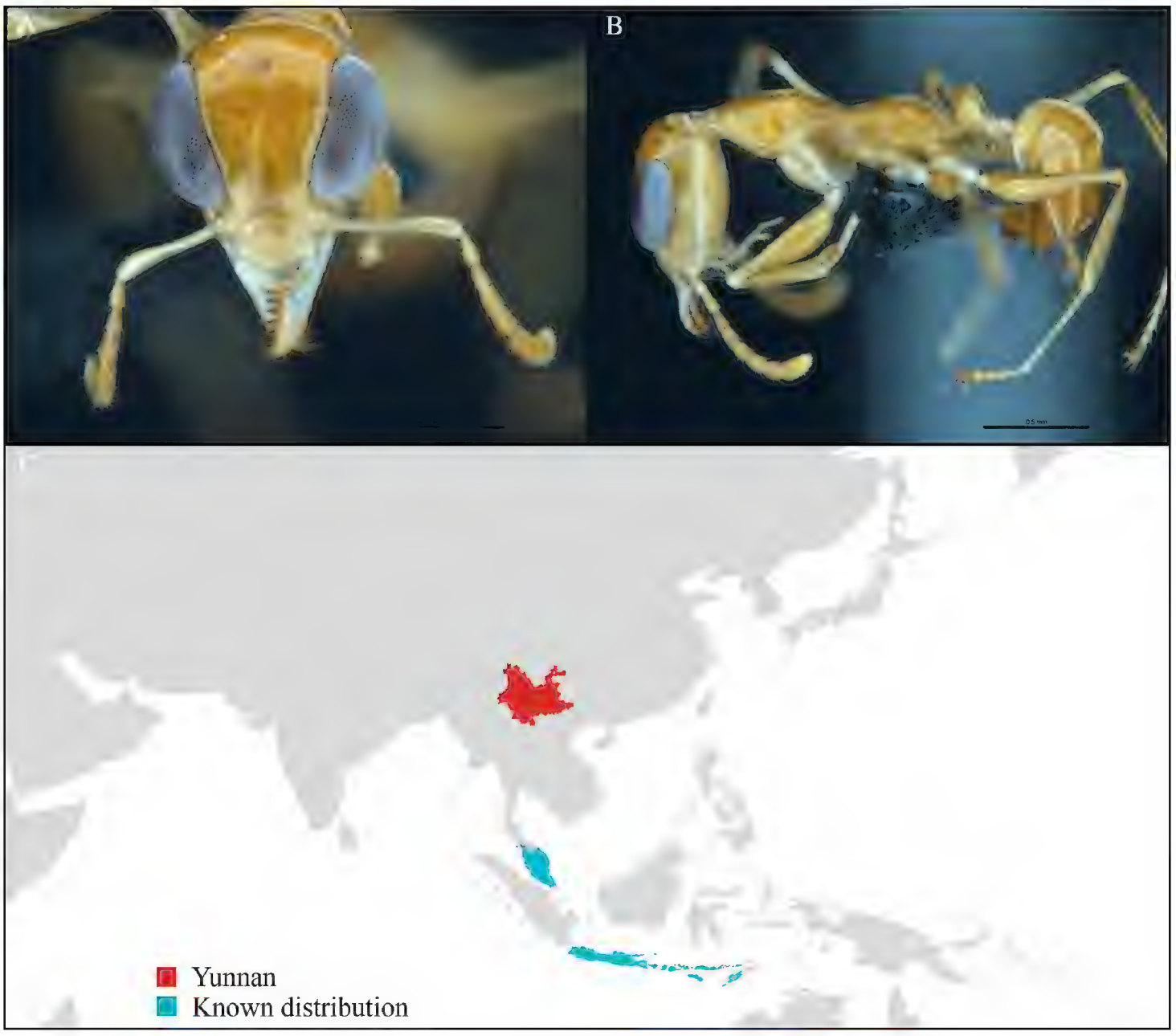

Figure 12. *Gesomyrmex kalshoveni* worker, CASENT0716525. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Yunnan (new record), Malaysia and Indonesia (Figure 12C). This new record represents an important extension in the northern range of the distribution of this species and the first occurrence of the genus *Gesomyrmex* from Yunnan province.

Taxonomic note. There is no available key for this genus. The identification is based on the original description (Wheeler 1929) and comparison with reference material from Borneo. Identification in *Gesomyrmex* is generally very difficult due to the high degree of worker polymorphism. However, our single specimen is a minor worker and fits the minor workers of *G. kalshoveni* very well.

Natural history. Little is known about the bionomics of *Gesomyrmex kalshoveni*. It has been collected from a small branch of a tree on the side of road.

***Gnamptogenys costata* (Emery, 1889)**
Figure 13

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.911°N, 101.281°E), Limestone forest, 06.vi.2013, 1 worker, 655m, Hand collection, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Rain forest, 08.vi.2013, 2 workers, 615m, Hand collection, B. Guénard, B. Blanchard and C. Liu

Distribution. Widely distributed in the Austral-Asian and Indo-Malayan subregions (Figure 13C).

Taxonomic note. The identification is based on the key provided by Lattke (2004). The material from Yunnan shows some minor variation in the development of gastral sculpture, which we consider as geographic, intraspecific variation.

Natural history. *Gnamptogenys costata* has been collected from foraging columns on the ground in rain forest and limestone forest.

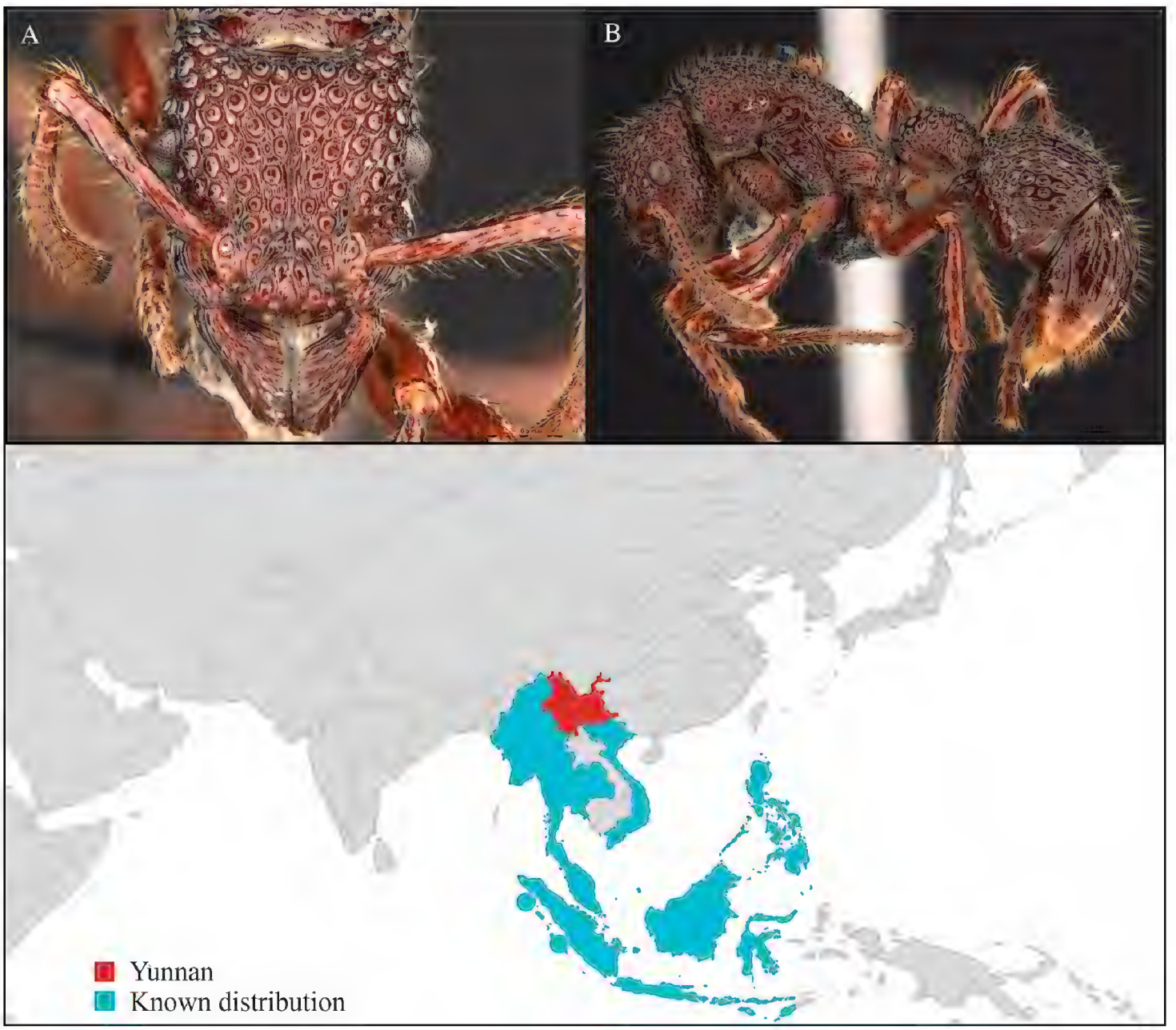

Figure 13. *Gnamptogenys costata* worker, CASENT0715692. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

***Gnamptogenys treta* Lattke, 2004**
Figure 14

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.912°N, 101.285°E), Limestone forest, 06.vi.2013, 1 worker, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.920°N, 101.240°E), Rain forest, 07.vi.2013, 1 worker, 665m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.271°E), Rubber plantation, 09.vi.2013, 7 workers, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Secondary forest, 12.vi.2013, 2 workers, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 10 workers, 865m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu

Distribution. Known from Yunnan (new record) and Borneo (Figure 14C). This collection represents the northern-most record in the distribution of *Gnamptogenys treta*.

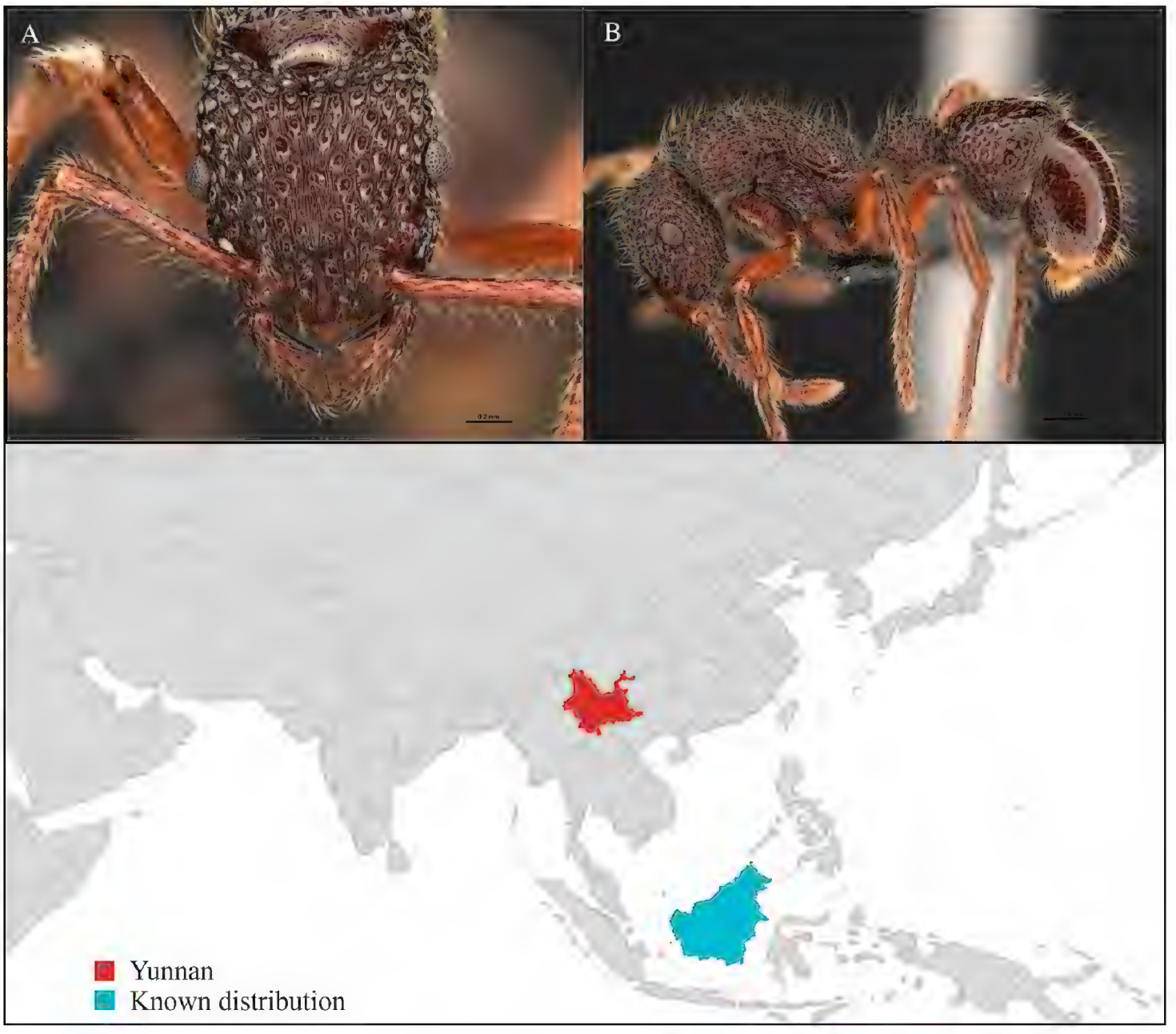

Figure 14. *Gnamptogenys treta* worker, CASENT0715166. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Taxonomic note. The identification is based on the key provided by Lattke (2004). Our material fits the holotype very well, except for the shape of the ventral process of the petiole, which is more rectangular in the material from Yunnan, whereas in the material from Borneo it is more triangular. Since this is the only difference we were able to observe, we treat it as intraspecific variation.

Natural history. *Gnamptogenys treta* has been collected from the leaf litter in rain forest, secondary forest and limestone forest and rubber plantation.

Myrmecina curvispina Zhou, Huang & Ma L., 2008

Figure 15

Material examined. CHINA, Yunnan, Xishuangbanna: "Holy Hills" (21.920°N, 101.240°E), Rain forest, 07.vi.2013, 1 worker, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.919°N, 101.239°E), Rain forest, 07.vi.2013, 1 worker, 670m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.961°N, 101.200°E), Rain forest, 10.vi.2013, 1 worker, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 12 workers, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 14 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Rubber plantation, 12.vi.2013, 1 worker, 705m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; : Man Sai village (21.907°N, 101.273°E), Rubber plantation, 12.vi.2013, 2 workers, 635m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; : Man Sai village (21.858°N, 101.277°E), Secondary forest, 12.vi.2013, 2 workers, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 3 workers, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Secondary forest, 12.vi.2013, 2 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.271°E), Rubber plantation, 09.vi.2013, 3 workers, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 1 worker, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.182°E), Limestone forest, 06.vi.2013, 9 workers, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.888°N, 101.266°E), Rubber Plantation, 14.vi.2013, 7 workers, 600m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.889°N, 101.267°E), Rubber Plantation, 14.vi.2013, 3 workers, 630m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.890°N, 101.267°E), Rubber Plantation, 14.vi.2013, 2 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record) and Guangxi (Figure 15C). This new record represents the western-most occurrence in the distribution of *Myrmecina curvispina*.

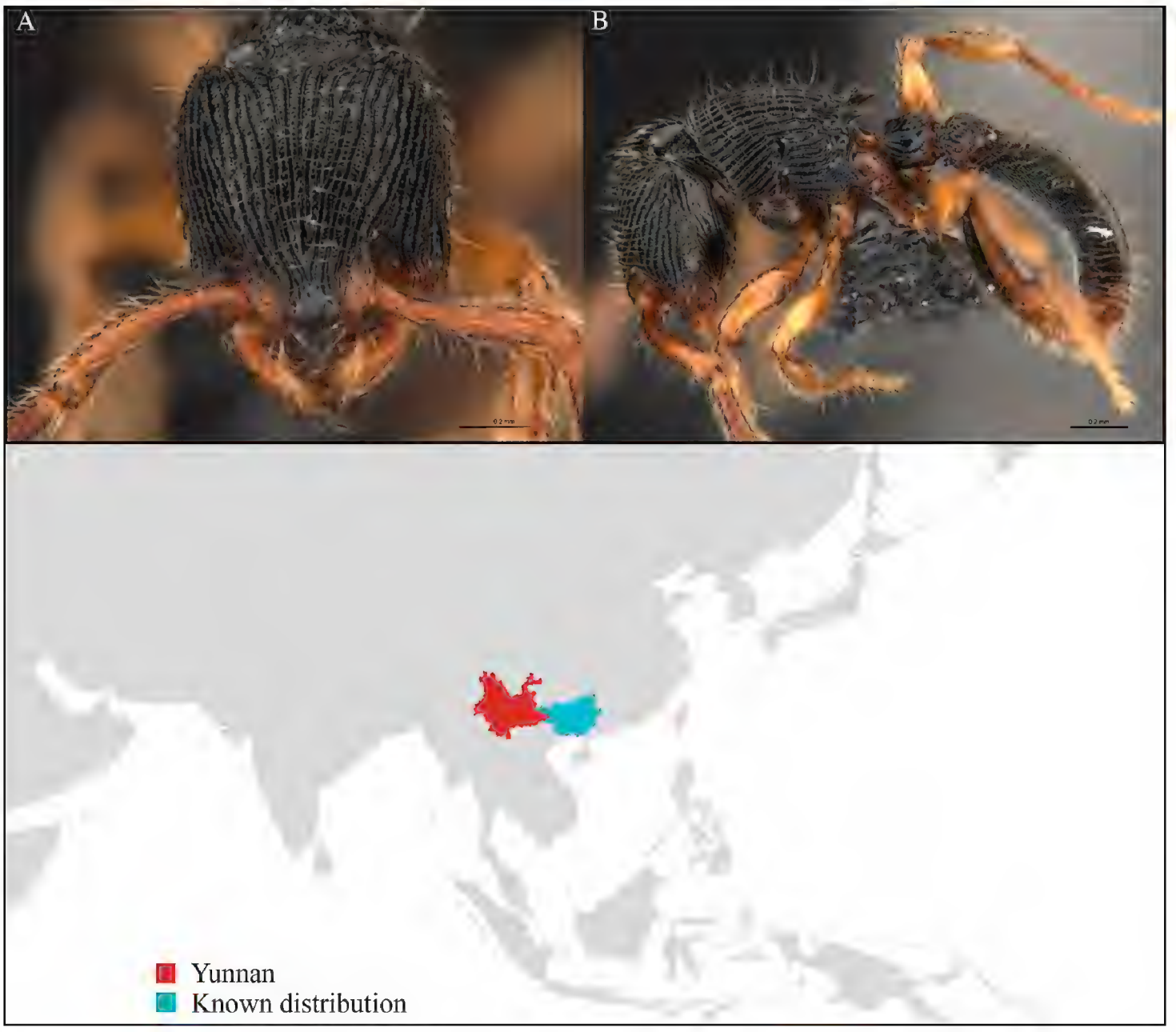

Figure 15. *Myrmecina curvispina* worker, CASENT0713308. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Taxonomic note. The identification is based on the original description and the identification key given by Zhou et al. (2008).

Natural history. *Myrmecina curvispina* has been collected from the leaf litter of various habitats such as rain forest, secondary forest and rubber plantation.

Myrmecina guangxiensis Zhou, 2001

Figure 16

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.912°N, 101.285°E), Secondary forest, 05.vi.2013, 4 workers, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Limestone forest, 06.vi.2013, 1 worker, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.281°E), Limestone forest, 06.vi.2013, 2 workers, 650m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.960°N,

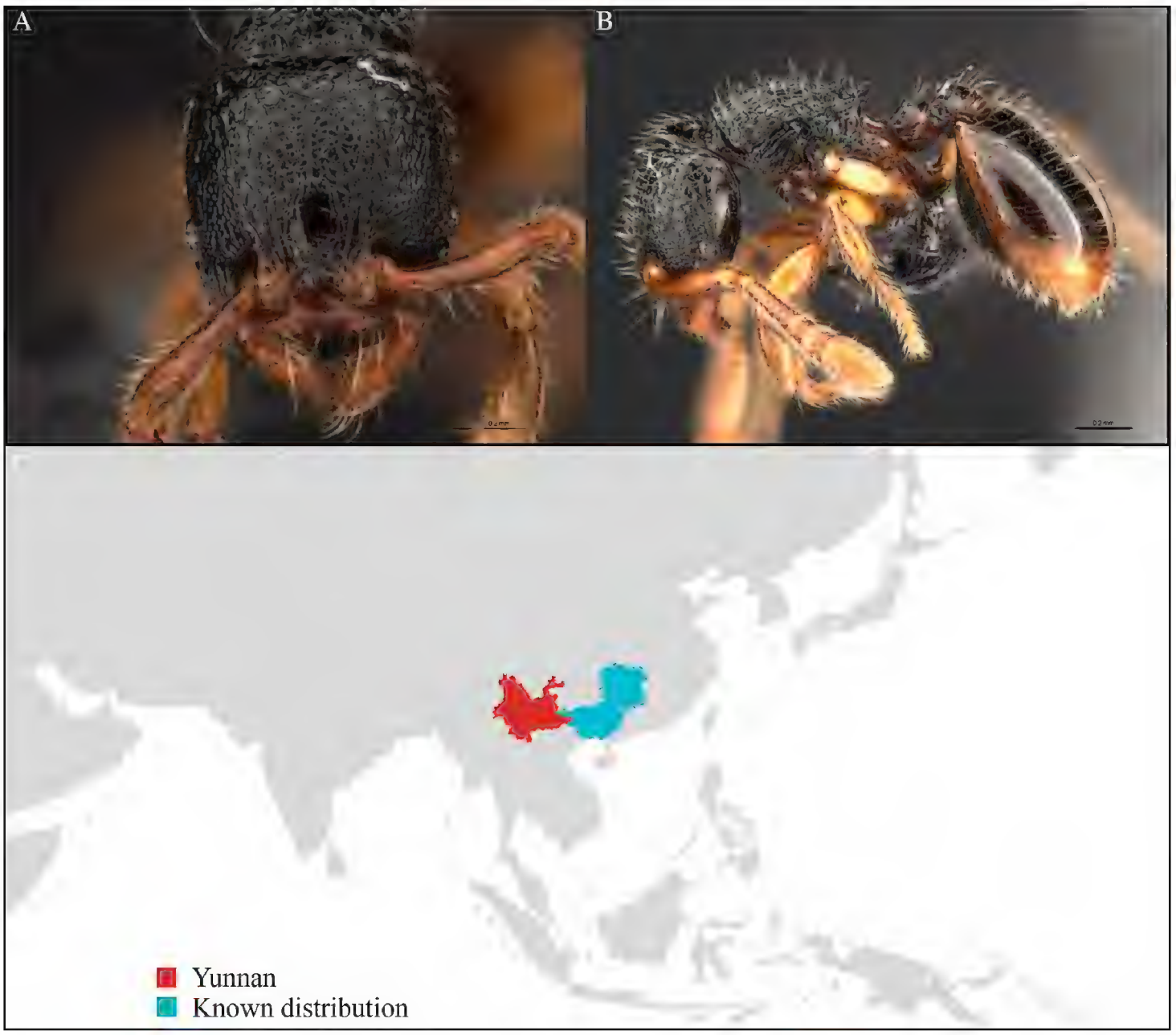

Figure 16. *Myrmecina guangxiensis* worker, CASENT0713314. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

101.199°E), Rain forest, 10.vi.2013, 1 worker, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 9 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record), Guangxi and Hunan (Figure 16C). This new record represents the western-most occurrence in the distribution of *Myrmecina guangxiensis*.

Taxonomic note. Identification is based on the key provided by Zhou et al. (2008).

Natural history. *Myrmecina guangxiensis* has been collected from leaf litter in rain forest, secondary forest and limestone forest.

Odontoponera denticulata (Smith, 1858)

Figure 17

Material examined. CHINA, Yunnan, Xishuangbanna: "Holy Hills" (21.920°N, 101.240°E), Secondary forest, 07.vi.2013, 1 worker, 655m, Winkler sifting, B.

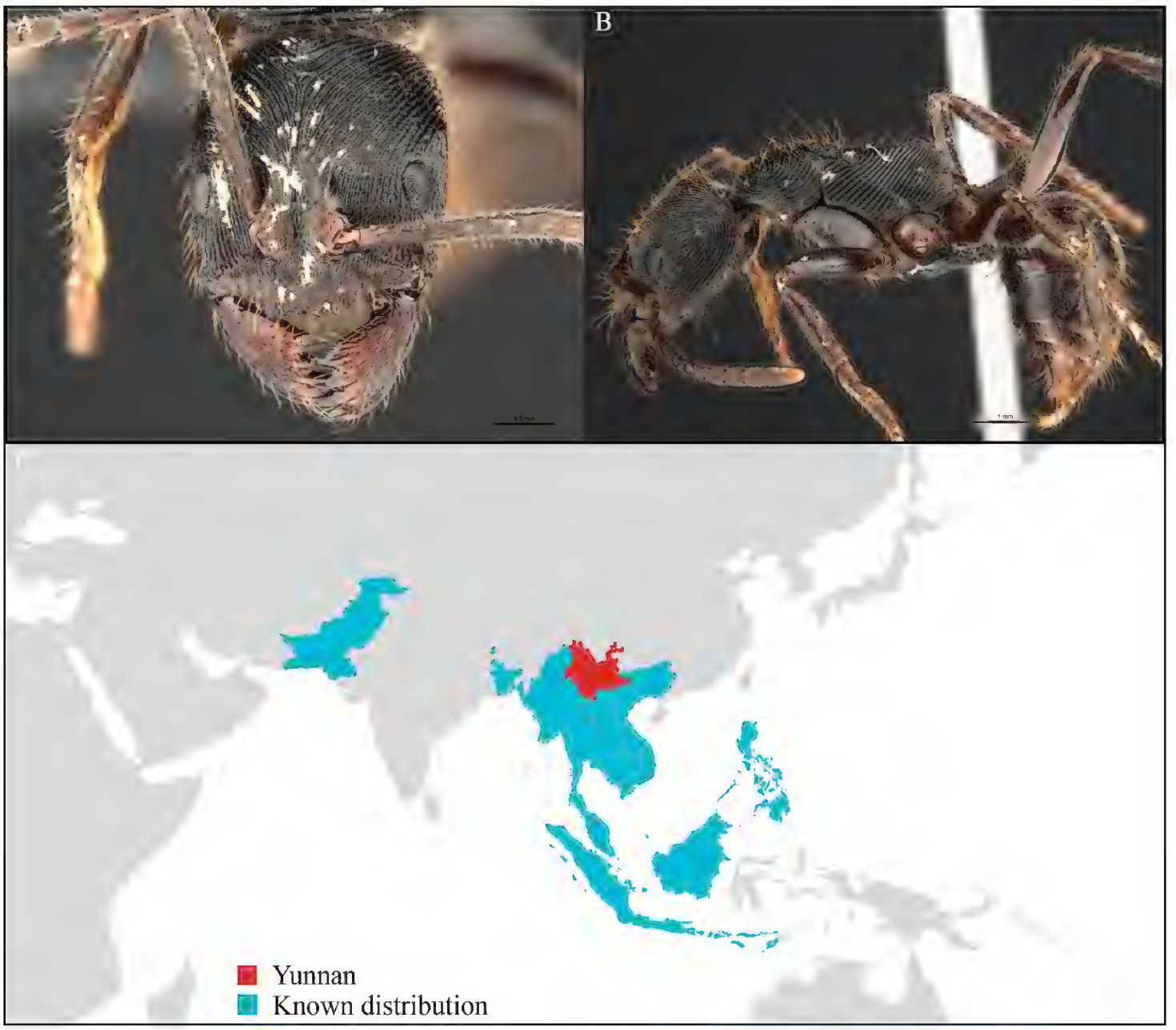

Figure 17. *Odontoponera denticulata* worker, CASENT0717236. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.920°N, 101.239°E), Secondary forest, 07.vi.2013, 2 workers, 665m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 1 worker, 825m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 1 worker, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 3 workers, 805m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 2 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.964°N, 101.202°E), Rain forest, 13.vi.2013, 1 worker, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.907°N, 101.273°E), Rubber plantation, 12.vi.2013, 1 worker, 635m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Rubber plantation, 12.vi.2013, 1 worker, 710m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest,

12.vi.2013, 1 worker, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Secondary forest, 12.vi.2013, 1 worker, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.933°N, 101.269°E), Rubber plantation, 09.vi.2013, 1 worker, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.271°E), Rubber plantation, 09.vi.2013, 5 workers, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.270°E), Rubber plantation, 09.vi.2013, 2 workers, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.269°E), Rubber plantation, 09.vi.2013, 1 worker, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.924°N, 101.268°E), Rubber plantation, 06.vi.2013, 3 workers, 571m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 1 worker, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.284°E), Limestone forest, 06.vi.2013, 3 workers, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.282°E), Limestone forest, 05.vi.2013, 1 worker, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Secondary forest, 08.vi.2013, 1 worker, 625m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.889°N, 101.267°E), Rubber Plantation, 14.vi.2013, 4 workers, 630m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.888°N, 101.266°E), Rubber Plantation, 14.vi.2013, 2 workers, 600m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.888°N, 101.266°E), Rubber Plantation, 14.vi.2013, 3 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.889°N, 101.267°E), Rubber Plantation, 14.vi.2013, 3 workers, 630m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.922°N, 101.268°E), Rubber Plantation, 14.vi.2013, 4 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.890°N, 101.267°E), Rubber Plantation, 14.vi.2013, 2 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in the Indo-Malayan subregion (Figure 17C).

Taxonomic note. The identification of our material is based on Yamane's (2009) redescription of *O. denticulata*.

Natural history. *Odontoponera denticulata* has been collected from the leaf litter in various habitats such as rain forest, secondary forest, limestone forest and rubber plantation.

Pheidole hongkongensis Wheeler, 1928

Figure 18

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 1 worker, 550m, Winkler sifting, B.

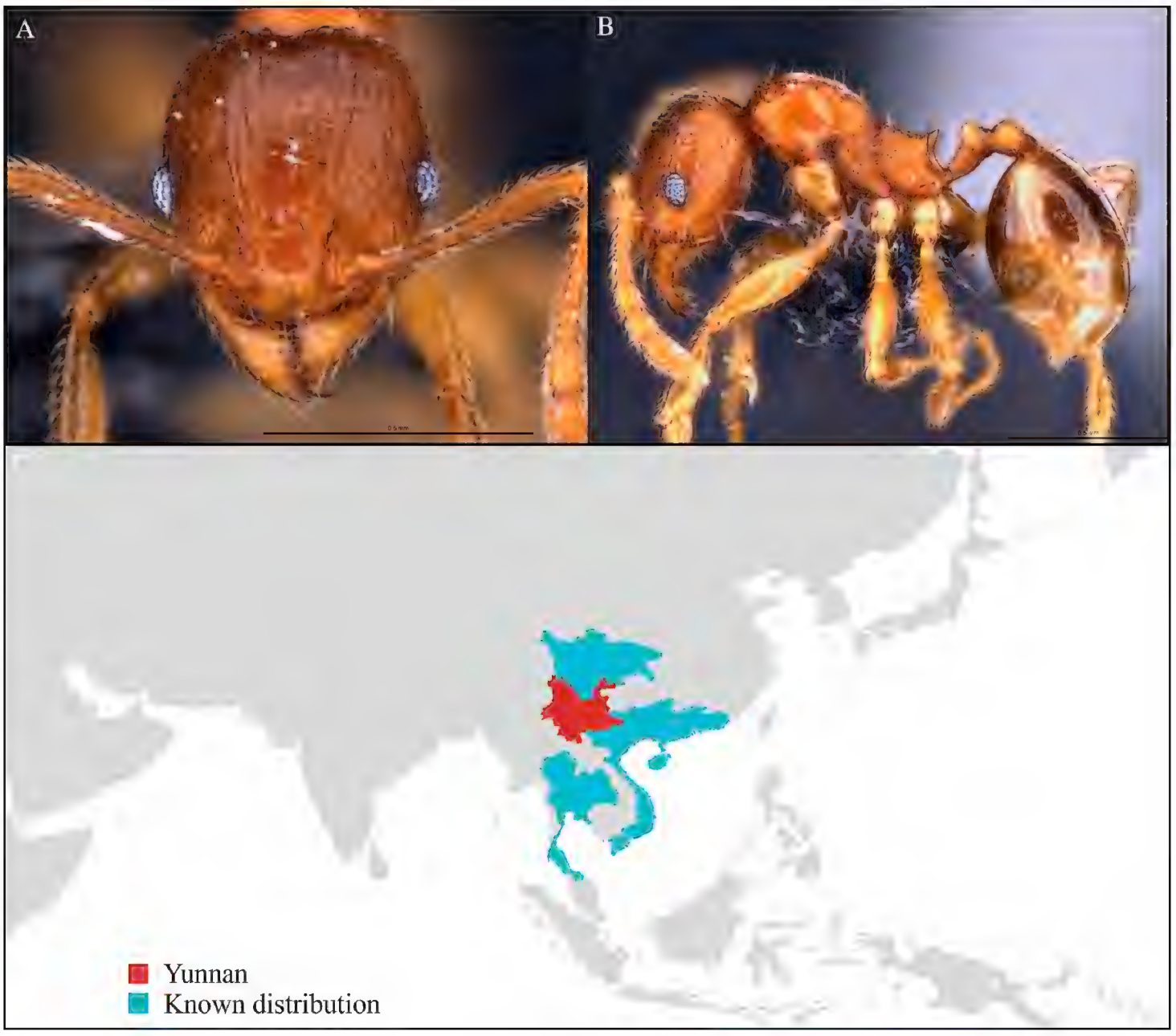

Figure 18. *Pheidole hongkongensis* worker, CASENT0714788. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 3 workers, 1 Soldier, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.924°N, 101.268°E), Secondary forest, 05.vi.2013, 2 workers, 571m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 1 worker, 581m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.285°E), Limestone forest, 06.vi.2013, 49 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.282°E), Limestone forest, 06.vi.2013, 6 workers, 1 Soldier, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.933°N, 101.269°E), Rubber plantation, 09.vi.2013, 3 workers, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 20 workers, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Secondary forest, 12.vi.2013, 1 worker, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.907°N, 101.273°E), Rubber plantation, 12.vi.2013, 3 workers,

635m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 5 workers, 1 Soldier, 805m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.922°N, 101.268°E), Rubber Plantation, 14.vi.2013, 1 worker, 629m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. South China, Vietnam and Thailand (Figure 18C).

Taxonomic note. *Pheidole hongkongensis* can be identified with the identification key to northern Vietnamese *Pheidole* published by Eguchi (2008).

Natural history. *Pheidole hongkongensis* has been collected from leaf litter in secondary forest, limestone forest and rubber plantations. It has also been reported inhabiting the soil of woody gardens, forest edges and open areas (Eguchi 2008).

Pheidole plagiaria Smith, 1860

Figure 19

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.912°N, 101.282°E), Limestone forest, 06.vi.2013, 2 workers, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.933°N, 101.269°E), Rubber Plantation, 09.vi.2013, 1 worker, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.960°N, 101.199°E), Rain forest, 10.vi.2013, 13 workers, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 10.vi.2013, 2 workers, 830m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in the Australasian and Indo-Malayan subregions (Figure 19C).

Taxonomic note. *Pheidole plagiaria* can be identified with the identification key to Northern Vietnamese *Pheidole* provided by Eguchi (2008).

Natural history. *Pheidole plagiaria* has been collected from leaf litter from rain forest, limestone forest and rubber plantation. It has also been reported inhabiting in the soil of forest edge and open land (Eguchi 2008).

Pheidole planifrons Santschi, 1920

Figure 20

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 2 workers, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.924°N, 101.268°E), Rubber plantation, 05.vi.2013, 3 workers, 571m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.283°E), Limestone forest, 06.vi.2013, 2 workers, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.282°E), Limestone forest, 06.vi.2013, 4 workers, 640m, Winkler sifting, B.

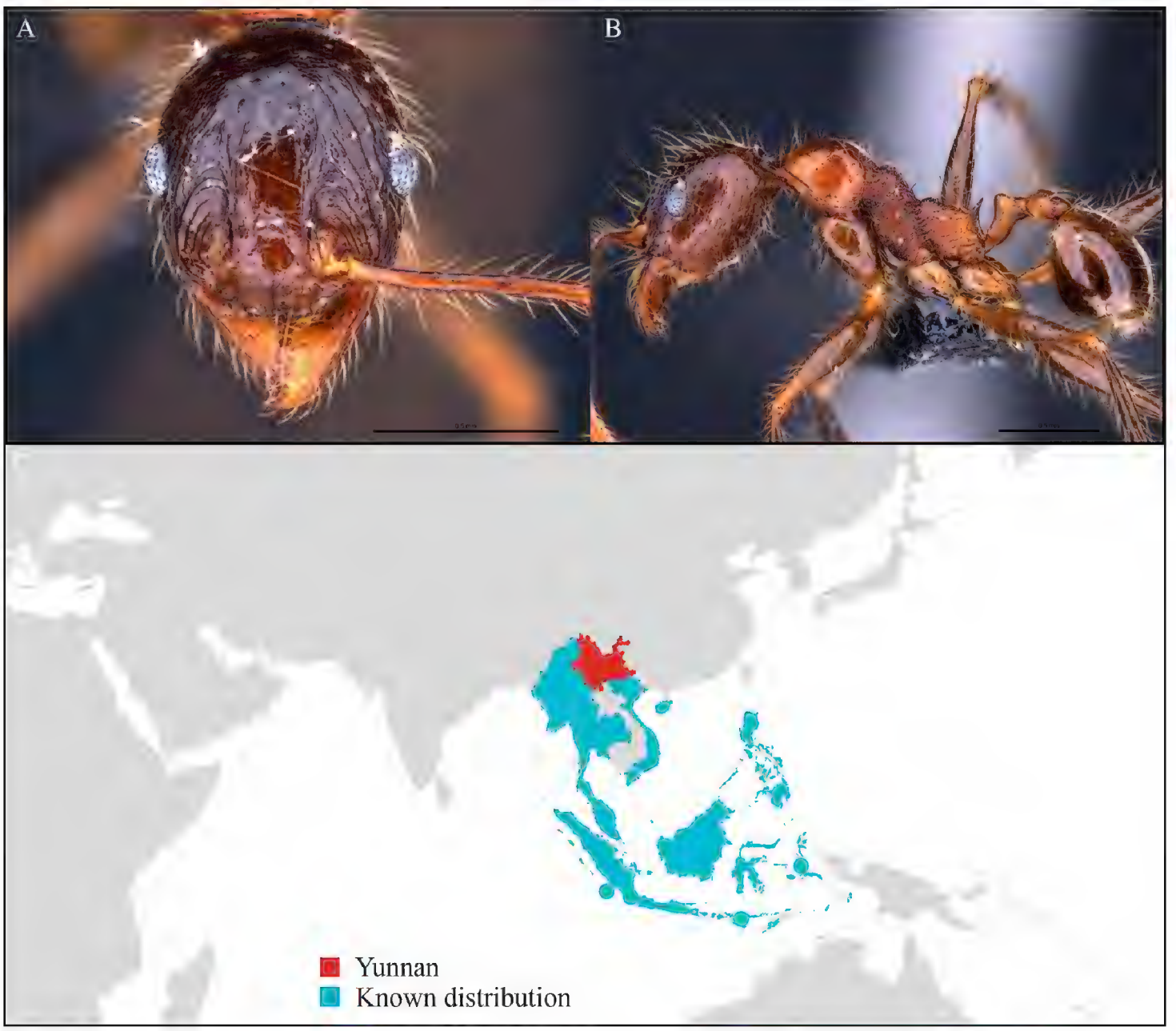

Figure 19. *Pheidole plagiaria* worker, CASENT0713421. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.281°E), Limestone forest, 06.vi.2013, 2 workers, 650m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.916°N, 101.274°E), Limestone forest, 08.vi.2013, 2 workers, 615m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.271°E), Rubber plantation, 09.vi.2013, 1 worker, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Rubber plantation, 12.vi.2013, 4 workers, 705m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.857°N, 101.277°E), Rubber plantation, 12.vi.2013, 1 worker, 710m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.907°N, 101.273°E), Rubber plantation, 12.vi.2013, 2 workers, 635m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Secondary forest, 12.vi.2013, 2 workers, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 9 workers, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.273°E), Secondary forest, 12.vi.2013, 1 work-

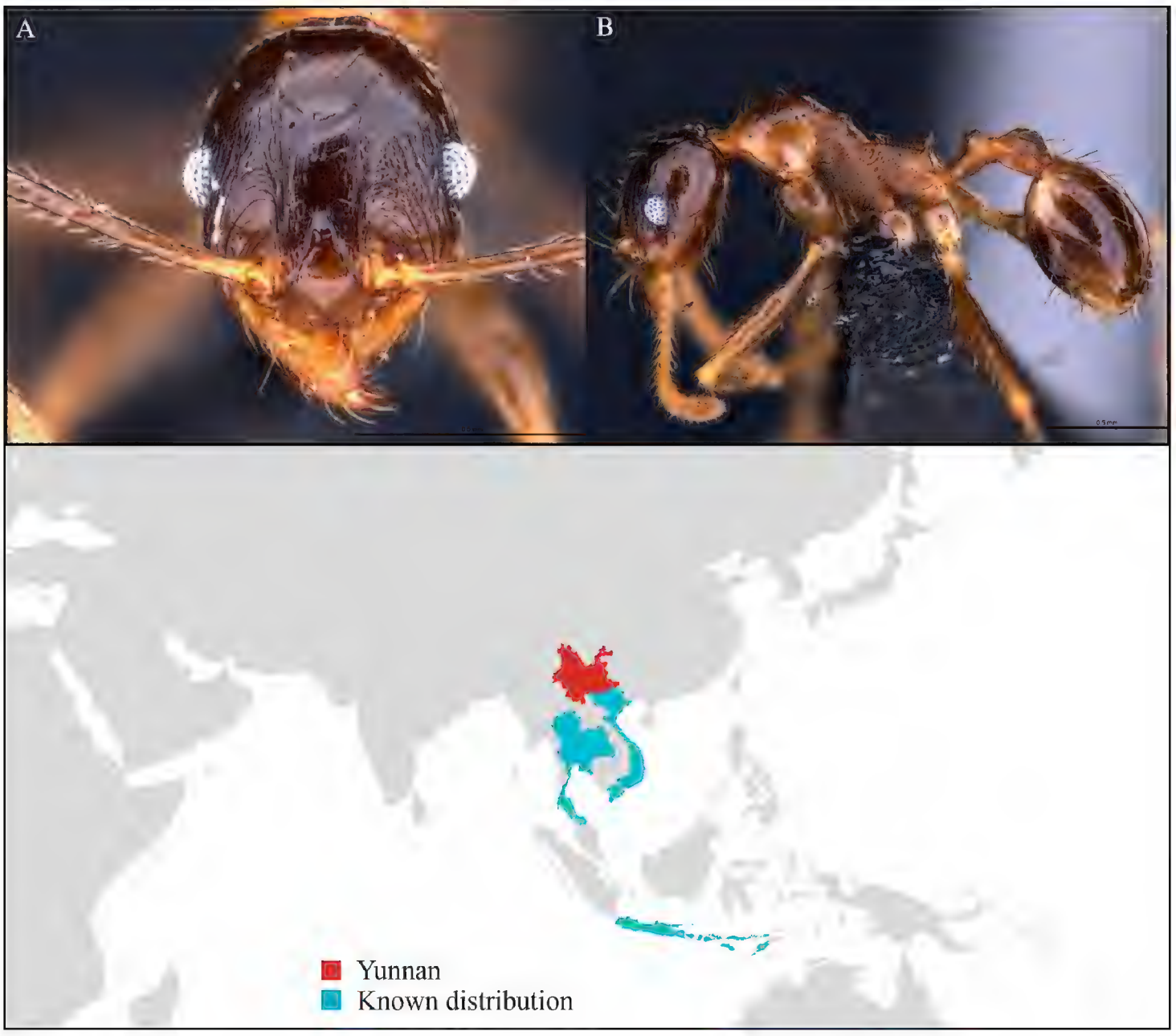

Figure 20. *Pheidole planifrons* worker, CASENT0713099. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

er, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Rain forest, 13.vi.2013, 3 workers, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.889°N, 101.267°E), Rubber Plantation, 14.vi.2013, 33 workers, 630m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.922°N, 101.268°E), Rubber Plantation, 14.vi.2013, 2 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record), Vietnam, Thailand and Java (Figure 20C). This new record represents the northern-most occurrence in the known distribution of *Pheidole planifrons*.

Taxonomic note. *Pheidole planifrons* can be identified with the identification key to Northern Vietnamese *Pheidole* provided by Eguchi (2008).

Natural history. *Pheidole planifrons* has been collected from leaf litter in rain forest, limestone forest and rubber plantations. It has also been reported inhabiting in the soil of forest edge and woody habitats (Eguchi 2008).

***Pheidole rugithorax* Eguchi, 2008**
Figure 21

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 3 workers, 1 Soldier, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.283°E), Limestone forest, 06.vi.2013, 1 worker, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.281°E), Limestone forest, 06.vi.2013, 3 workers, 650m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.920°N, 101.239°E), Rain forest, 07.vi.2013, 2 workers, 665m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Yunnan (new record), Vietnam, Myanmar and Thailand (Figure 21C).

Taxonomic note. *Pheidole rugithorax* can be identified with the identification key to Northern Vietnamese *Pheidole* provided by Eguchi (2008).

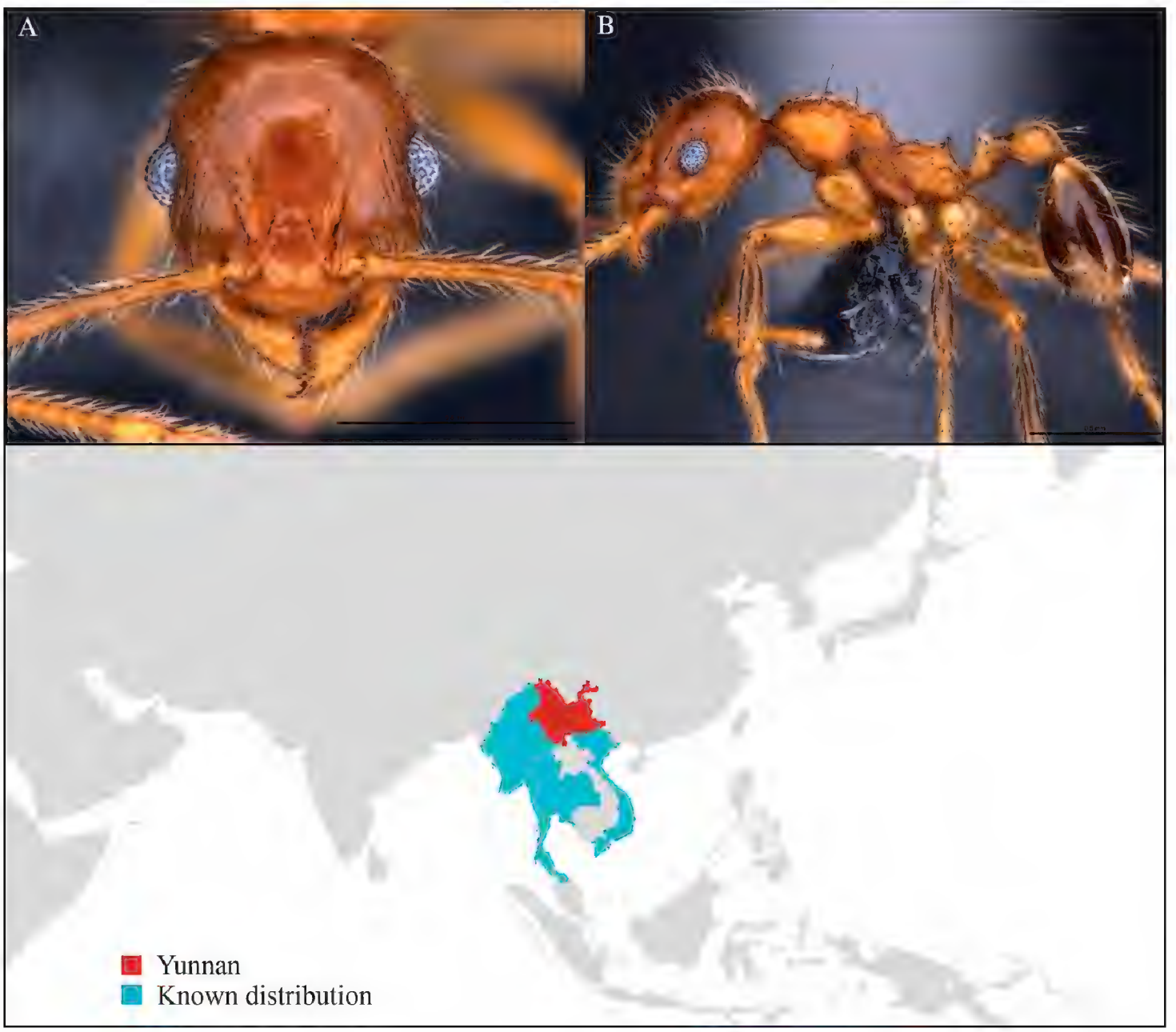

Figure 21. *Pheidole rugithorax* worker, CASENT0717083. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Natural history. *Pheidole rugithorax* has been collected from leaf litter in rain forest, secondary forest and limestone forest. Otherwise there is no available information on its biology.

Pheidole smythiesii Forel, 1902

Figure 22

Material examined. China, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 9 workers, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 2 workers, 581m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.283°E), Limestone forest, 05.vi.2013, 1 worker, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 5 workers, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in South China, Vietnam, Thailand and India (Figure 22C).

Taxonomic note. *Pheidole smythiesii* can be identified with the identification key to Northern Vietnamese *Pheidole* provided by Eguchi (2008).

Natural history. *Pheidole smythiesii* has been collected from leaf litter from secondary forest. Eguchi (2008) reported the species to usually inhabit woody habitats and sometimes open areas where it nests in the soil. *Pheidole smythiesii* is also known to tend aphid colonies (Alfred and Agarwal 1990).

Pheidole tumida Eguchi, 2008

Figure 23

Material examined. CHINA, Yunnan, Xishuangbanna: "Holy Hills" (21.920°N, 101.239°E), Rain forest, 07.vi.2013, 2 workers, 665m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Rain forest, 13.vi.2013, 2 workers, 825m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Rain forest, 13.vi.2013, 3 workers, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Rubber plantation, 12.vi.2013, 4 workers, 705m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.907°N, 101.273°E), Rubber plantation, 12.vi.2013, 2 workers, 635m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.857°N, 101.277°E), Rubber plantation, 12.vi.2013, 3 workers, 710m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Secondary forest, 12.vi.2013, 15 workers, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 2 workers, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Secondary forest, 12.vi.2013, 2 workers, 680m,

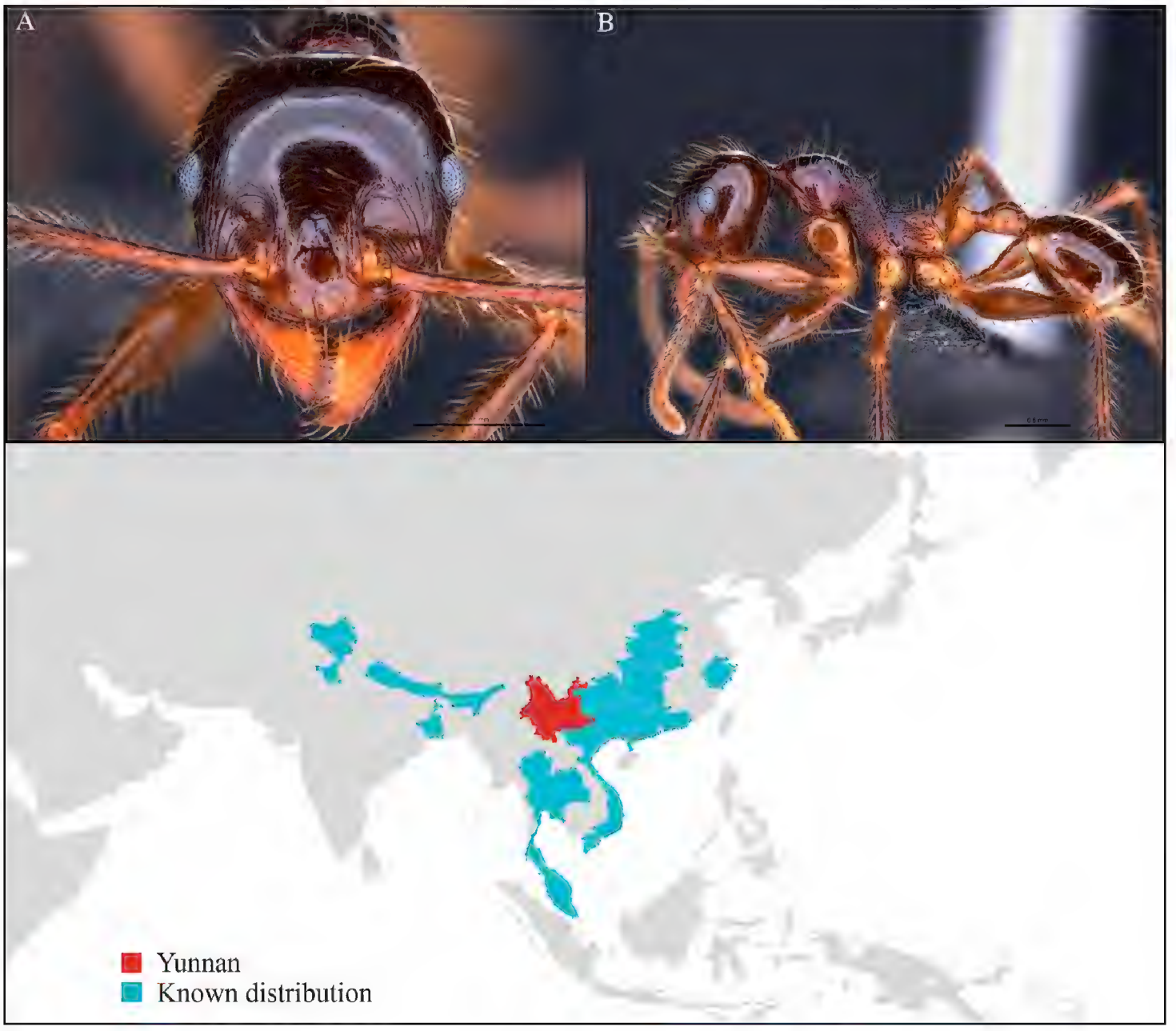

Figure 22. *Pheidole smythiesii* worker, CASENT0713851. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 4 workers, 2 Soldiers, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.934°N, 101.269°E), Rubber plantation, 09.vi.2013, 5 workers, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.933°N, 101.269°E), Rubber plantation, 09.vi.2013, 34 workers, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.270°E), Rubber plantation, 09.vi.2013, 2 workers, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.271°E), Rubber plantation, 09.vi.2013, 3 workers, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.931°N, 101.269°E), Rubber plantation, 09.vi.2013, 1 worker, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.933°N, 101.269°E), Rubber plantation, 09.vi.2013, 2 workers, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 1 worker, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.283°E), Secondary forest, 06.vi.2013, 1 worker, 675m,

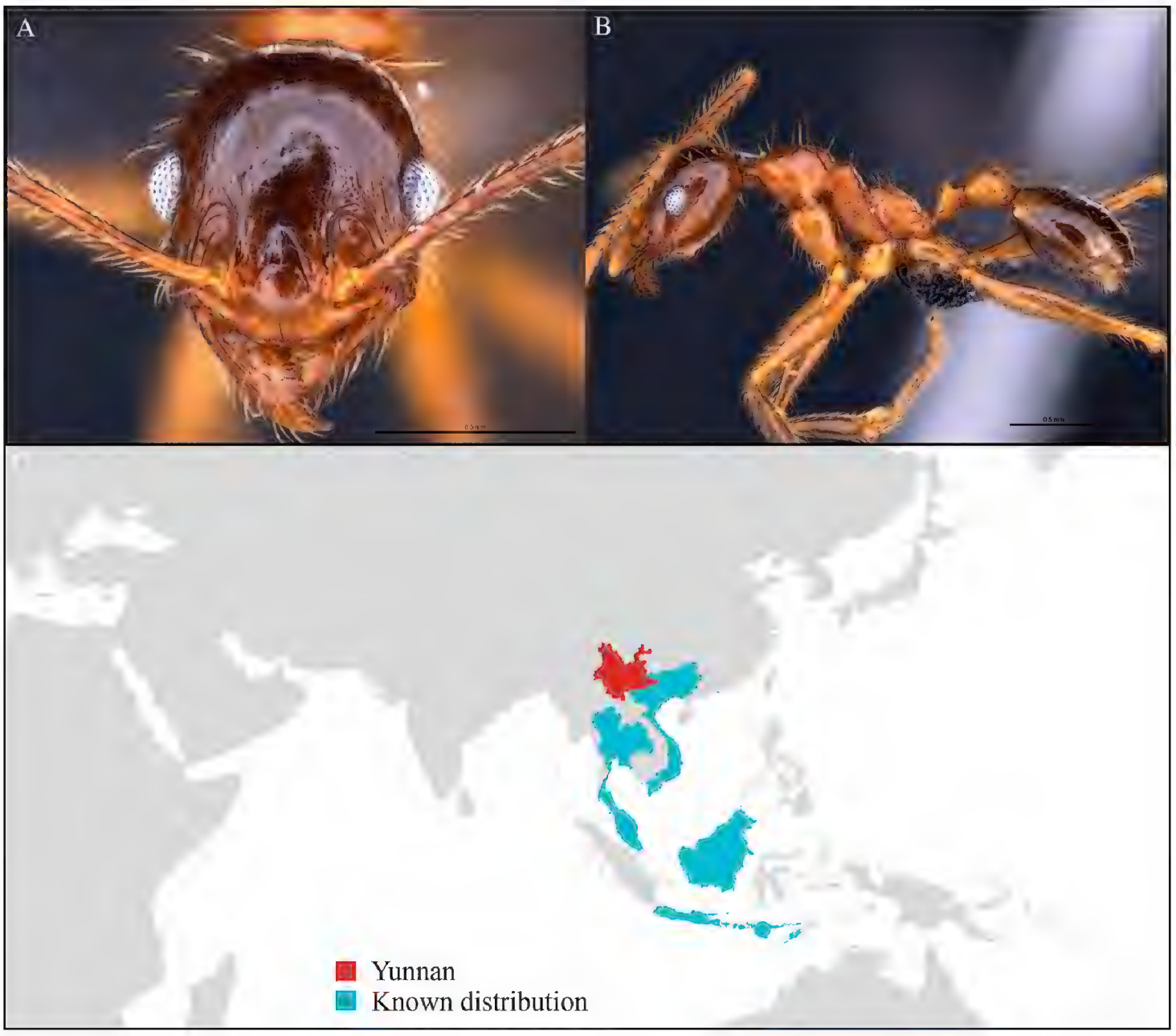

Figure 23. *Pheidole tumida* worker, CASENT0713125. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.924°N, 101.268°E), Secondary forest, 05.vi.2013, 1 worker, 571m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.888°N, 101.266°E), Rubber Plantation, 14.vi.2013, 1 worker, 600m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.888°N, 101.266°E), Rubber Plantation, 14.vi.2013, 1 worker, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.922°N, 101.268°E), Rubber Plantation, 14.vi.2013, 6 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in the Australasian and Indo-Malayan subregions (Figure 23C).

Taxonomic note. *Pheidole tumida* can be identified with the identification key to Northern Vietnamese *Pheidole* provided by Eguchi (2008).

Natural history. *Pheidole tumida* has been collected from leaf litter in rain forest, secondary forest and rubber plantation. It has also been reported nesting in the soil and rotting logs of forest edges (Eguchi 2008).

***Pheidole vieti* Eguchi, 2008**
Figure 24

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.912°N, 101.285°E), Limestone forest, 06.vi.2013, 3 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Secondary forest, 06.vi.2013, 3 workers, 625m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.961°N, 101.200°E), Rain forest, 10.vi.2013, 3 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from Yunnan (new record) and Vietnam (Figure 24C). This new record represents the northern-most occurrence in the distribution of *Pheidole vieti*.

Taxonomic note. *Pheidole vieti* can be identified with the key given provided by Eguchi (2008).

Natural history. *Pheidole vieti* has been collected from leaf litter from rain forest, secondary forest and limestone forest.

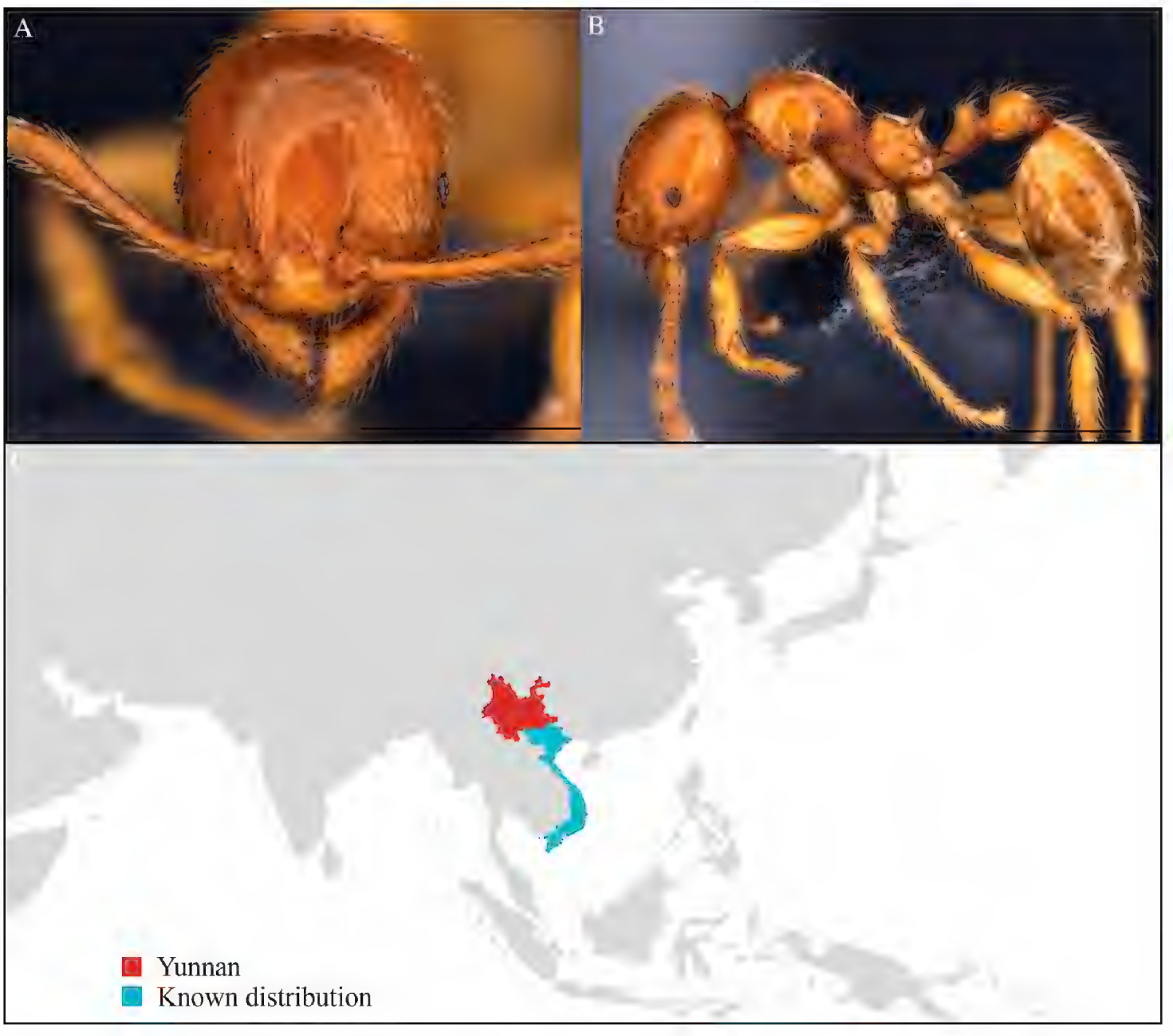

Figure 24. *Pheidole vieti* worker, CASENT0713428. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Pheidole zoceana Santschi, 1925

Figure 25

Material examined. CHINA, Yunnan, Xishuangbanna: "Holy Hills" (21.920°N, 101.240°E), Secondary forest, 07.vi.2013, 44 workers, 644m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.920°N, 101.239°E), Secondary forest, 07.vi.2013, 5 workers, 665m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.919°N, 101.239°E), Secondary forest, 07.vi.2013, 11 workers, 670m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 15 workers, 825m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 1 worker, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 7 workers, 3 Soldiers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.960°N, 101.199°E), Rain forest, 13.vi.2013, 25 workers, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 5 workers, 805m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 14 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.964°N, 101.202°E), Rain forest, 13.vi.2013, 2 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 1 worker, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.271°E), Rubber Plantation, 09.vi.2013, 1 worker, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 77 workers, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.285°E), Limestone forest, 05.vi.2013, 22 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Secondary forest, 06.vi.2013, 2 workers, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.924°N, 101.268°E), Rubber plantation, 05.vi.2013, 3 workers, 571m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 1 worker, 581m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.916°N, 101.274°E), Secondary forest, 05.vi.2013, 12 workers, 615m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from a few localities in China, Vietnam and Thailand (Figure 25C).

Taxonomic note. *Pheidole zoceana* can be identified with the identification key to Northern Vietnamese *Pheidole* provided by Eguchi (2008).

Natural history. *Pheidole zoceana* has been collected from leaf litter in rain forest, secondary forest and rubber plantations. It has also been reported nesting in the soil of forest edges and mountainous area (Eguchi 2008).

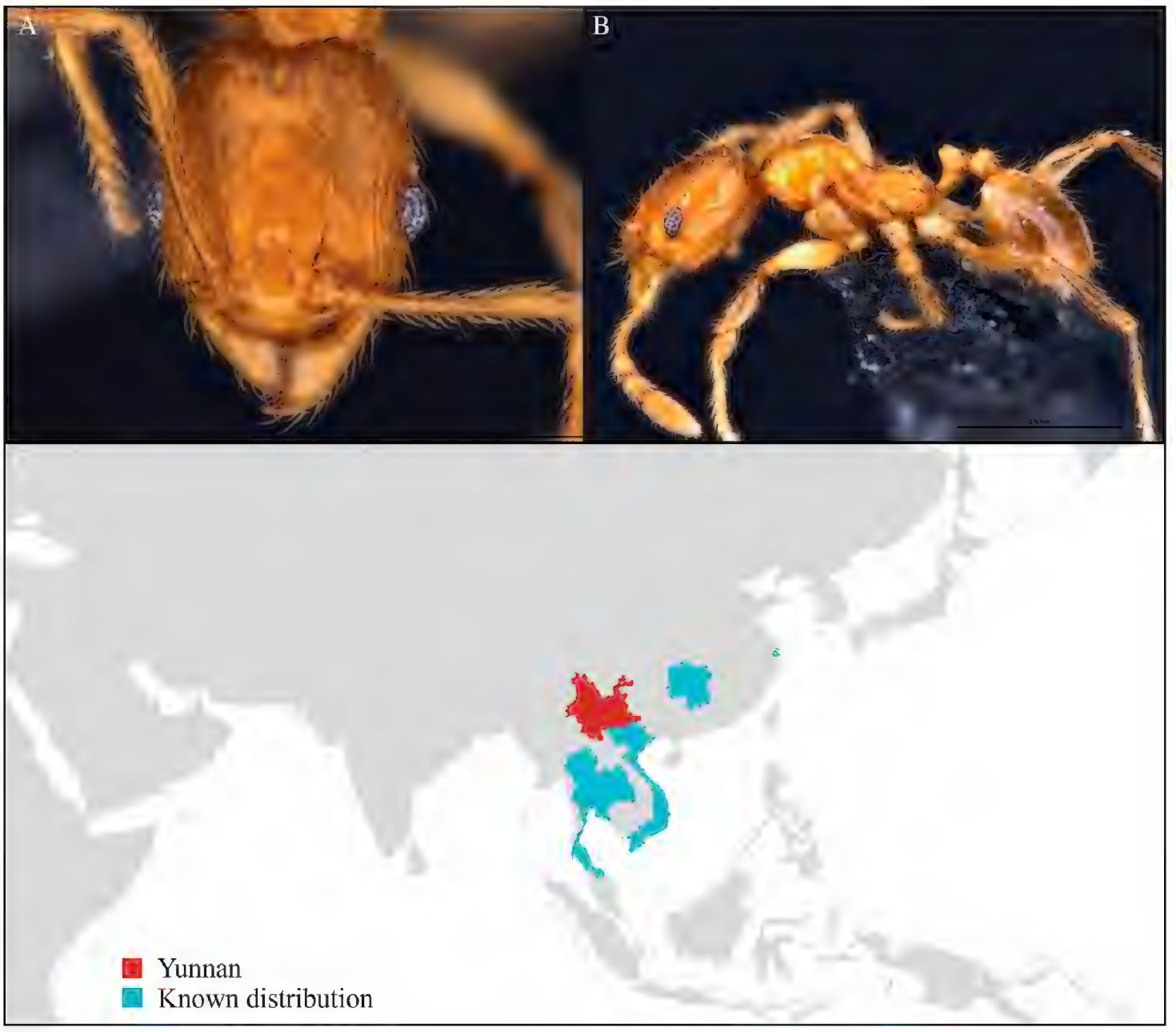

Figure 25. *Pheidole zoceana* worker, CASENT0714742. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Prenolepis sphingthoraxa Zhou & Zheng, 1998

Figure 26

Material examined. CHINA, Yunnan, Xishuangbanna: Kilometer 55 station (21.960°N, 101.199°E), Rain forest, 10.vi.2013, 1 worker, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from Middle and South China (Figure 26C). This new record represents the western-most record in the distribution of *Prenolepis sphingthoraxa*.

Taxonomic note. The identification is based on the original description (Zhou and Zheng 1998).

Natural history. *Prenolepis sphingthoraxa* has been collected from leaf litter in rain forest and little is known about its bionomics.

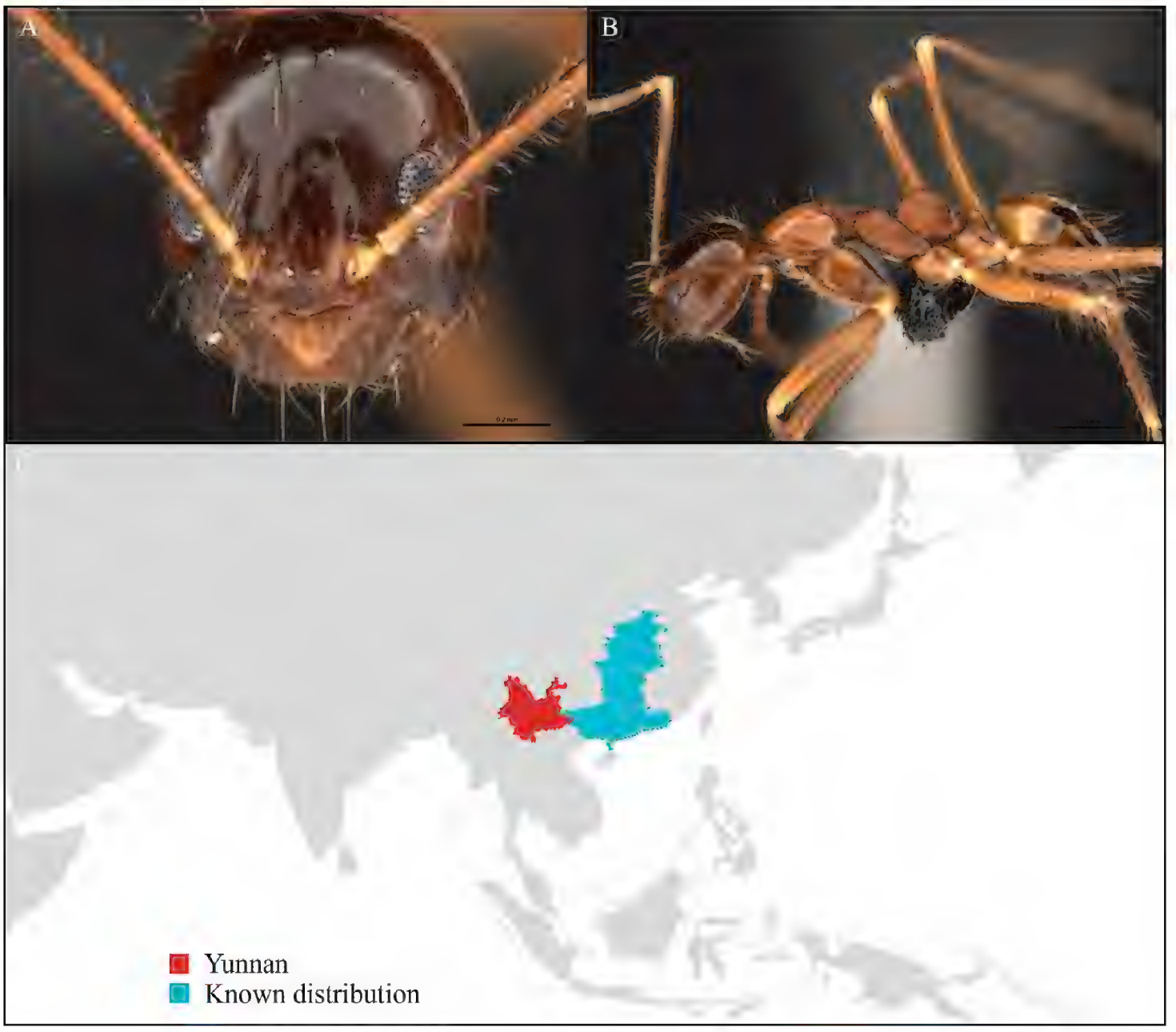

Figure 26. *Prenolepis sphingthoraxa* worker, CASENT0715549. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Proceratium deelemani Perrault, 1981

Figure 27

Material examined. CHINA, Yunnan, Xishuangbanna: Kilometer 55 station (21.964°N, 101.202°E), Rain forest, 13.vi.2013, 1 worker, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from Yunnan (new record), Singapore, Thailand and Borneo (Figure 27C). This new record represents the northern-most record in the distribution of *Proceratium deelemani*.

Taxonomic note. The identification of *Proceratium deelemani* is relatively straightforward with the key provided by Baroni Urbani and De Andrade (2003).

Natural history. *Proceratium deelemani* has been collected from leaf litter in rain forest, and little is known about its bionomics.

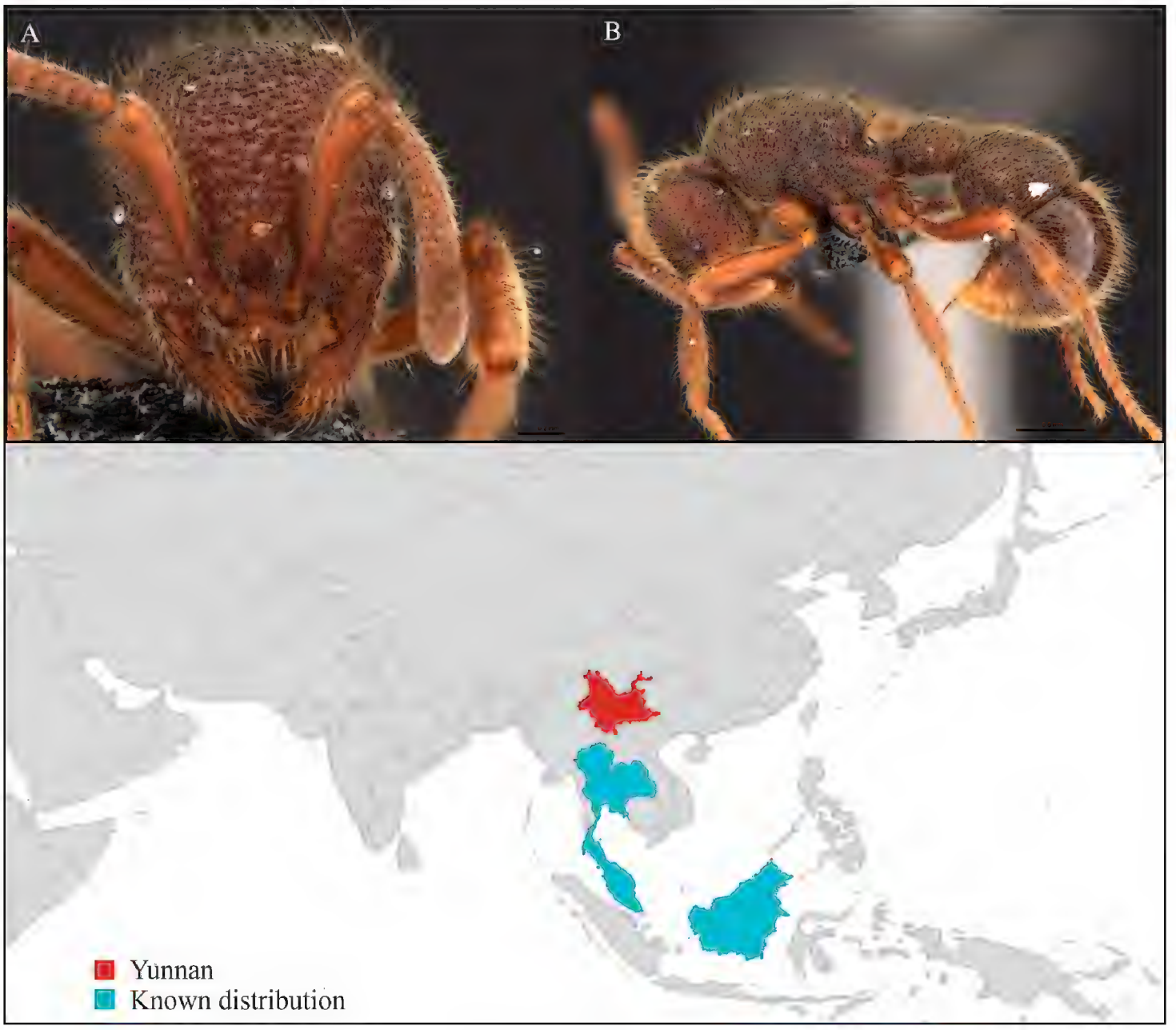

Figure 27. *Proceratium deelemani* worker, CASENT0717686. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Recurvidris kemneri (Wheeler & Wheeler, 1954)

Figure 28

Material examined. CHINA, Yunnan, Xishuangbanna: "Holy Hills" (21.919°N, 101.239°E), Secondary forest, 07.vi.2013, 1 worker, 670m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.857°N, 101.277°E), Rubber plantation, 12.vi.2013, 3 workers, 710m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 1 worker, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Secondary forest, 12.vi.2013, 1 worker, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 10.vi.2013, 7 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in the Austral-Asian and Indo-Malayan subregions (Figure 28C). This new northern-most record represents an important extension in the distribution of *Recurvidris kemneri.*

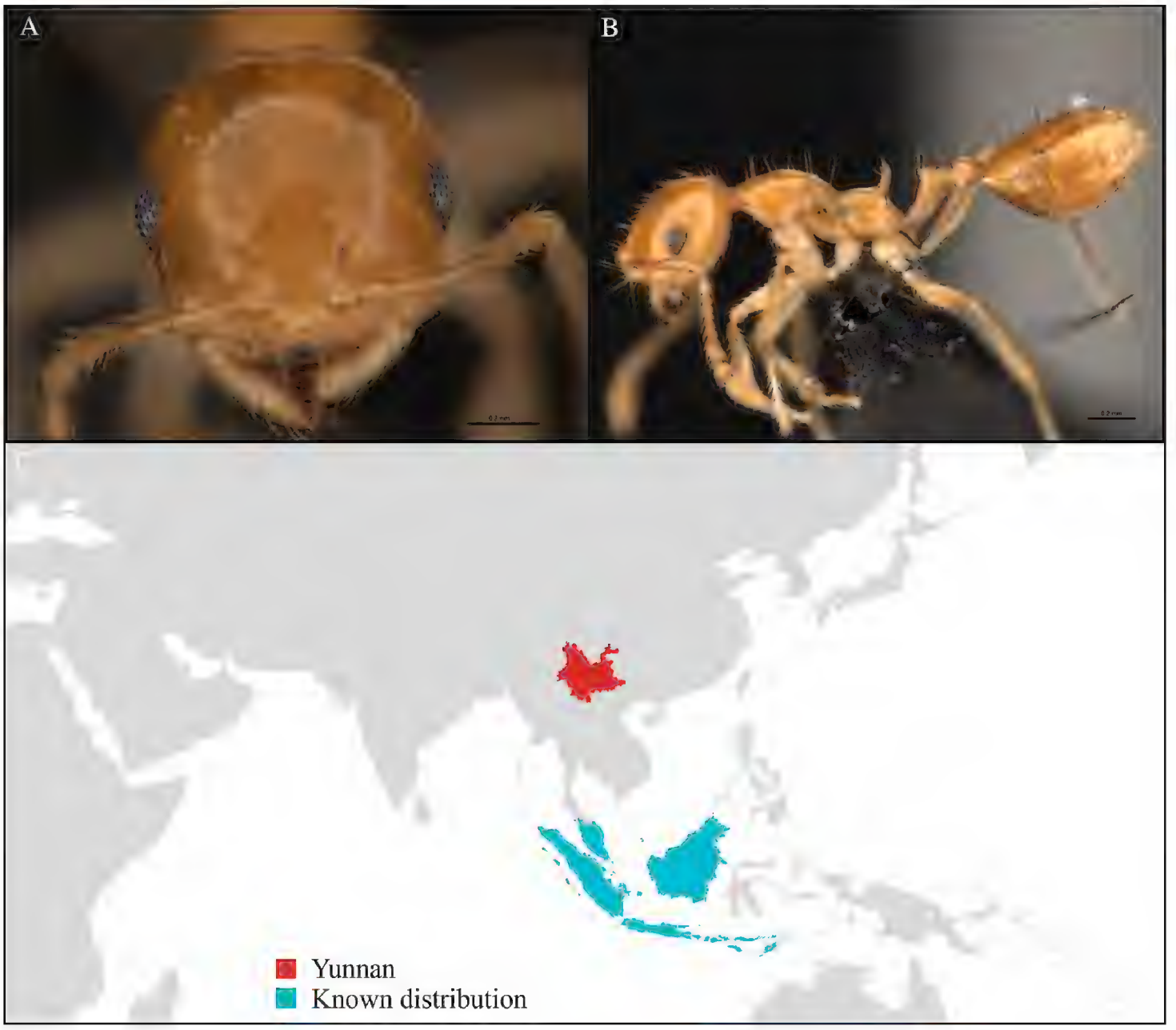

Figure 28. *Recurvidris kemneri* worker, CASENT0715218. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Taxonomic note. The identification is based on Bolton's (1992) key. Our material from Yunnan fits the re-description in the latter publication very well, even though the propodeal spines seem somewhat longer than in the material from Borneo. However, we consider this as a minor geographic variation.

Natural history. *Recurvidris kemneri* has been collected from leaf litter from rain forest, secondary forest and rubber plantation, and little is known about its bionomics.

Strumigenys dyschima (Bolton, 2000)

Figure 29

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.911°N, 101.283°E), Limestone forest, 06.vi.2013, 2 workers, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Figure 29. *Strumigenys dyschima* worker, CASENT0717009. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Known from Yunnan (new record) and Borneo (Figure 29C). This new record represents an important extension in the northern range of the distribution of *Strumigenys dyschima.*

Taxonomic note. *Strumigenys dyschima* can be identified with the identification key given by Bolton (2000; treated as *Pyramica dyschima*).

Natural history. *Strumigenys dyschima* has been collected from leaf litter in limestone forest, and little is known about its bionomics.

Strumigenys kichijo (Terayama, Lin & Wu, 1996)

Figure 30

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.924°N, 101.268°E), Rubber Plantation, 05.vi.2013, 1 worker, 571m, Winkler sifting, B.

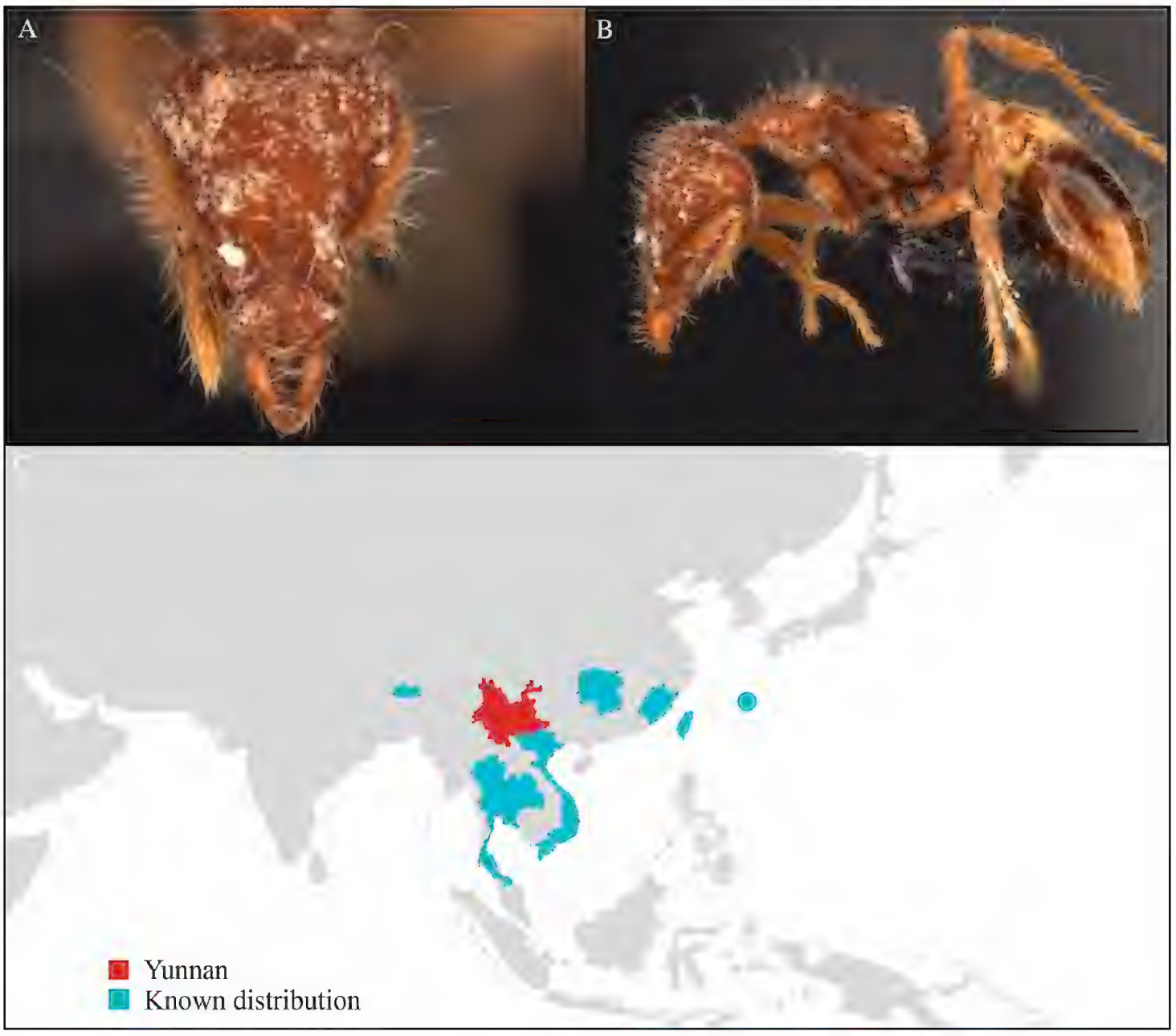

Figure 30. *Strumigenys kichijo* worker, CASENT0713674. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Guénard, B. Blanchard and C. Liu; Menglun town (21.934°N, 101.269°E), Rubber Plantation, 09.vi.2013, 1 worker, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in Indo-Malayan subregions (Figure 30C).

Taxonomic note. *Strumigenys kichijo* can be identified with the identification key given by Bolton (2000; treated as *Pyramica kichijo*).

Natural history. *Strumigenys kichijo* has been collected from leaf litter in rubber plantations, and little is known about its bionomics.

Strumigenys mitis (Brown, 2000)

Figure 31

Material examined. CHINA, Yunnan, Xishuangbanna: "Holy Hills" (21.920°N, 101.239°E), Secondary forest, 07.vi.2013, 9 workers, 655m, Winkler sifting, B.

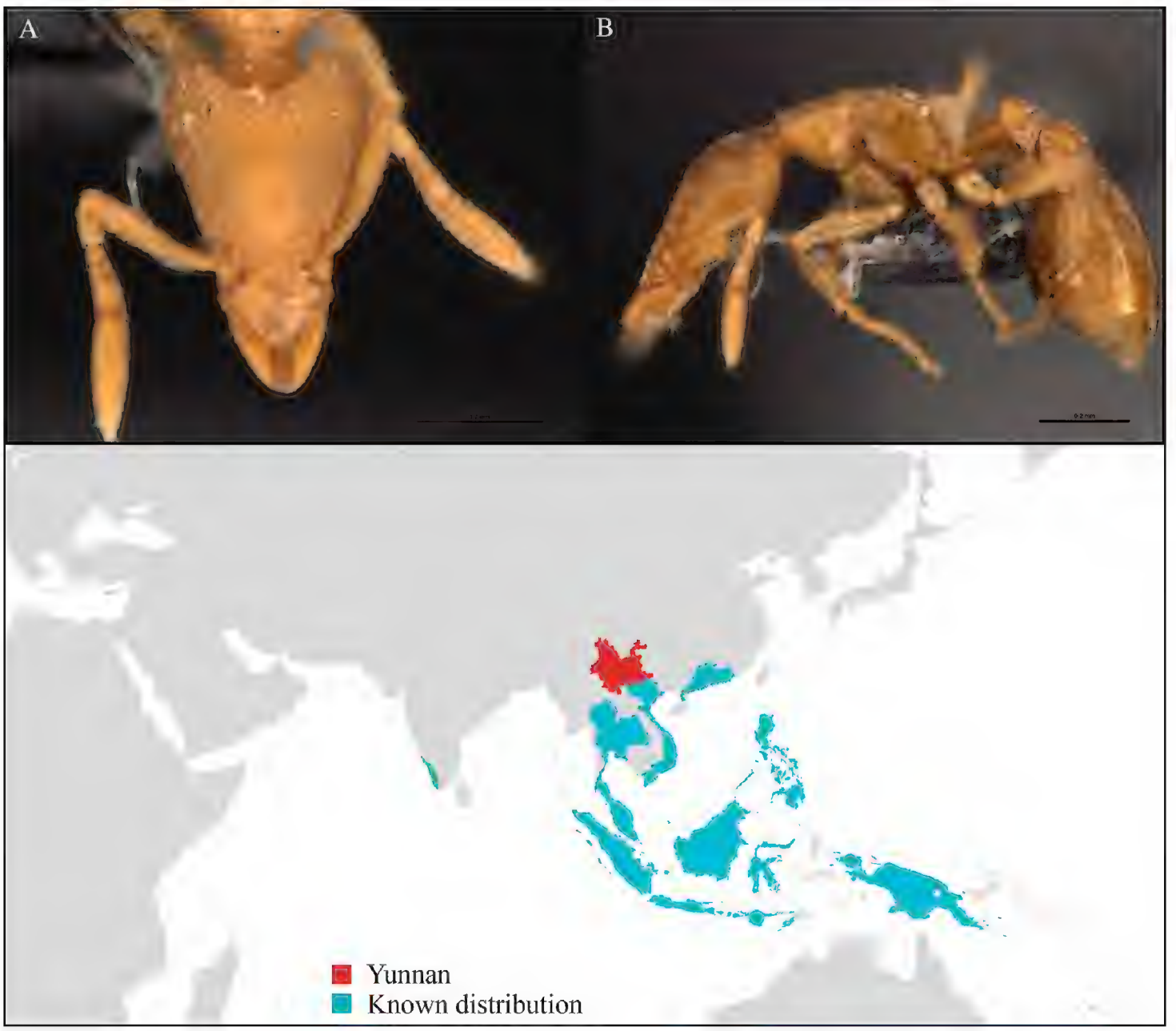

Figure 31. *Strumigenys mitis* worker, CASENT0713676. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.919°N, 101.239°E), Rain forest, 07.vi.2013, 7 workers, 670m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 40 workers, 825m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.966°N, 101.203°E), Secondary forest, 13.vi.2013, 1 worker, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 10.vi.2013, 19 workers, 830m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.961°N, 101.200°E), Rain forest, 10.vi.2013, 8 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.960°N, 101.199°E), Rain forest, 13.vi.2013, 1 worker, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 111 worker, 805m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 122 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.964°N, 101.202°E), Rain forest, 13.vi.2013,

50 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Secondary forest, 12.vi.2013, 1 worker, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 12 workers, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.271°E), Rubber plantation, 09.vi.2013, 8 workers, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.932°N, 101.270°E), Rubber plantation, 09.vi.2013, 1 worker, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.931°N, 101.269°E), Rubber plantation, 09.vi.2013, 1 worker, 645m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.924°N, 101.268°E), Rubber Plantation, 05.vi.2013, 1 worker, 571m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 82 workers, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 48 workers, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 71 workers, 581m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.916°N, 101.274°E), Secondary forest, 08.vi.2013, 2 workers, 615m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Secondary forest, 08.vi.2013, 25 workers, 625m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Widely distributed in Austral-Asian and Indo-Malayan subregions (Figure 31C). This new record represents the northern-most known occurrence in the distribution of *Strumigenys mitis*.

Taxonomic note. *Strumigenys mitis* can be identified with the identification key given by Bolton (2000; treated as *Pyramica mitis*) and Bharti (2013, treated as *Pyramica mitis*).

Natural history. *Strumigenys mitis* has been collected from leaf litter in rain forest, secondary forest and rubber plantations, and little is known about its bionomics.

Strumigenys nepalensis Baroni Urbani & De Andrade, 1994

Figure 32

Material examined. CHINA, Yunnan, Xishuangbanna: "Holy Hills" (21.920°N, 101.240°E), Secondary forest, 07.vi.2013, 5 workers, 655m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.920°N, 101.239°E), Secondary forest, 07.vi.2013, 12 workers, 665m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.919°N, 101.239°E), Rain forest, 07.vi.2013, 1 worker, 670m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 2 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Rubber Plantation, 12.vi.2013, 2 workers, 705m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.857°N, 101.277°E), Rubber Plantation,

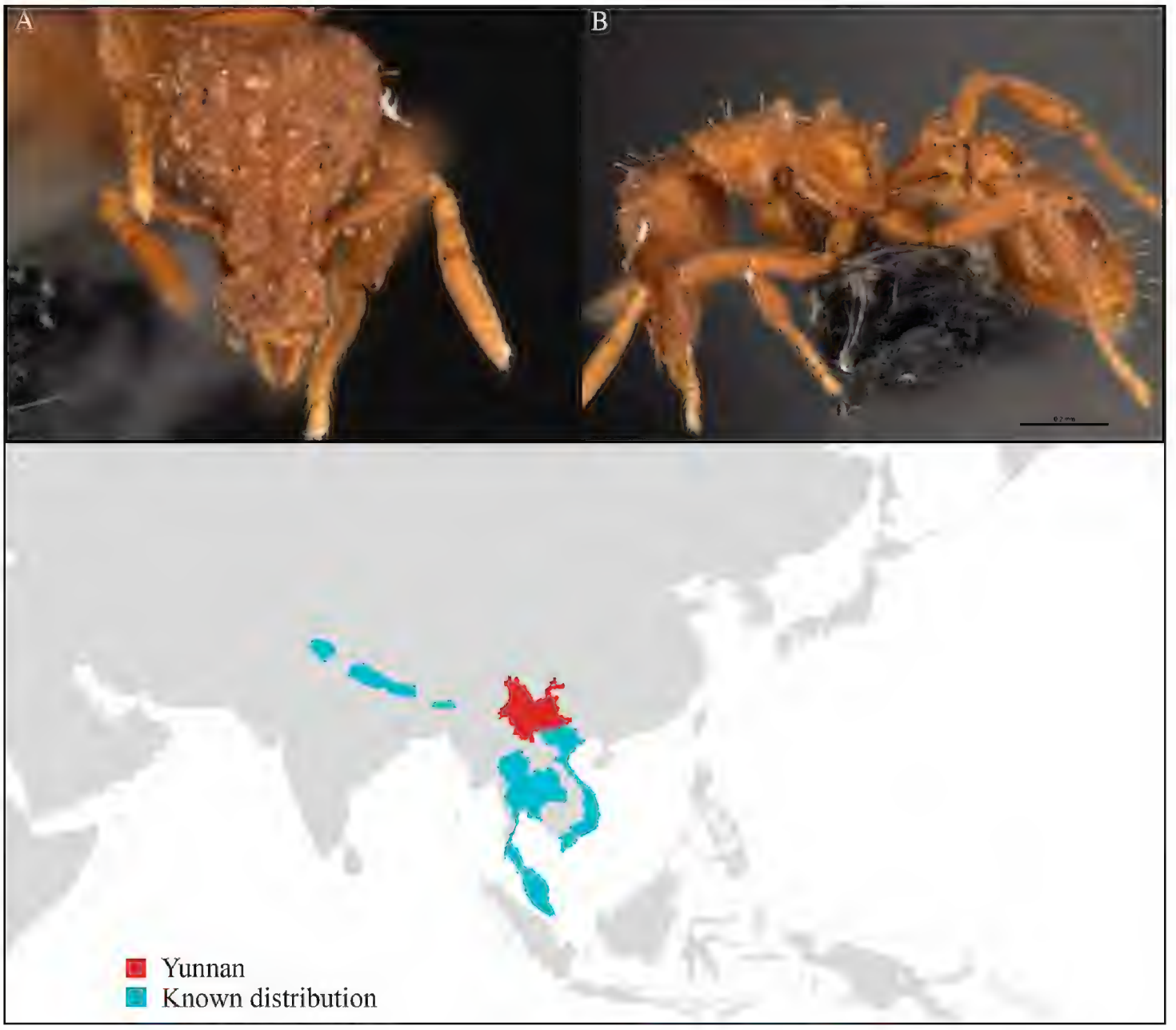

Figure 32. *Strumigenys nepalensis* worker, CASENT0715046. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

12.vi.2013, 2 workers, 710m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.277°E), Secondary forest, 12.vi.2013, 2 workers, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 3 workers, 690m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 4 workers, 685m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Secondary forest, 12.vi.2013, 6 workers, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.858°N, 101.276°E), Secondary forest, 12.vi.2013, 1 worker, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 57 workers, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.285°E), Limestone forest, 06.vi.2013, 1 worker, 680m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 13 workers, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.283°E),

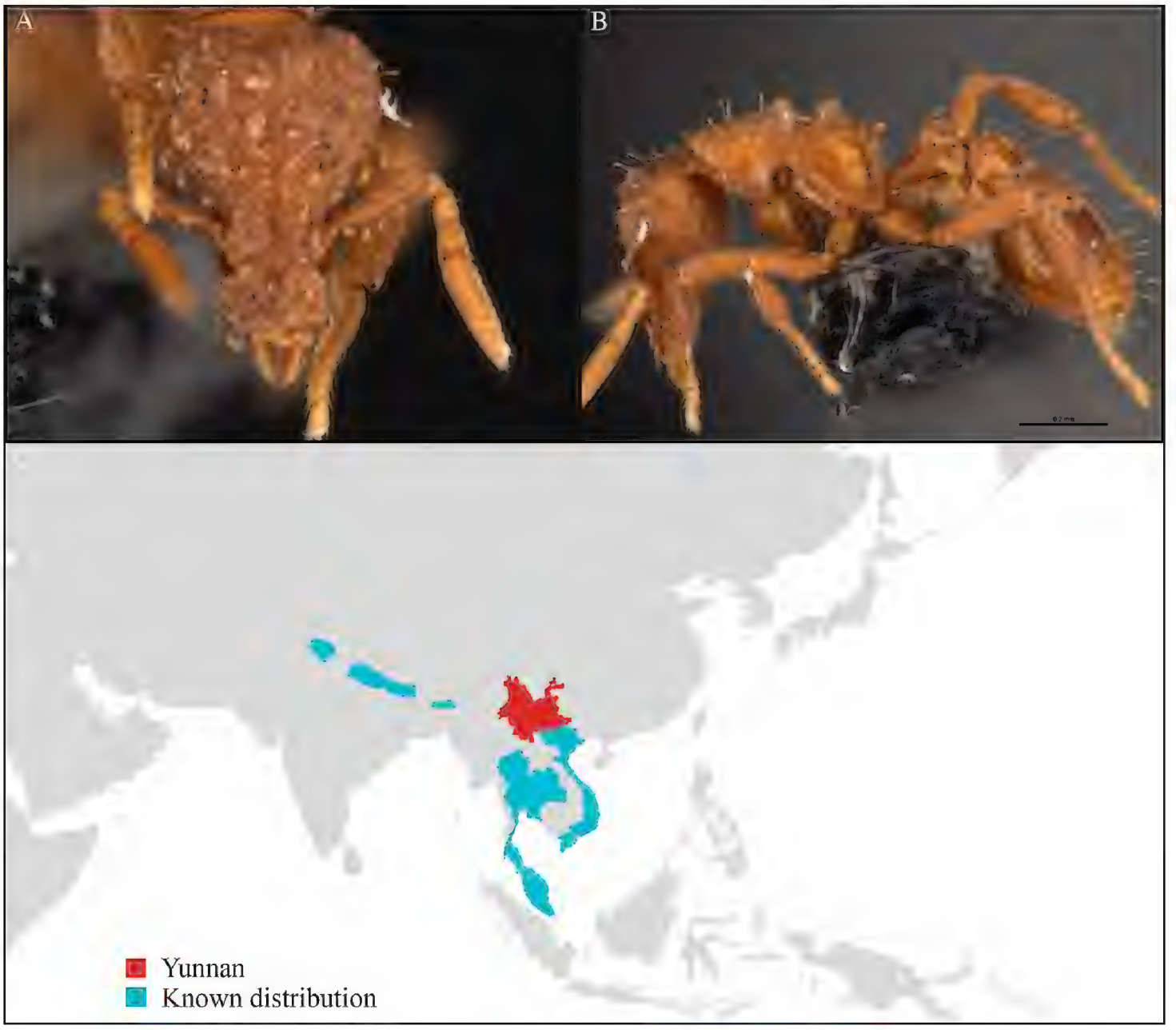

Figure 33. *Strumigenys rallarhina* worker, CASENT0715395. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Limestone forest, 06.vi.2013, 7 workers, 675m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.912°N, 101.282°E), Limestone forest, 06.vi.2013, 21 workers, 640m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.281°E), Limestone forest, 06.vi.2013, 21 workers, 650m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.888°N, 101.266°E), Rubber plantation, 14.vi.2013, 3 workers, 600m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.888°N, 101.266°E), Rubber plantation, 14.vi.2013, 6 workers, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Banna University construction site (21.922°N, 101.268°E), Rubber plantation, 14.vi.2013, 1 worker, 620m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from Yunnan (new record), North Indian, Vietnam and Thailand (Figure 32C).

Taxonomic note. *Strumigenys nepalensis* can be identified with the identification key given by Bolton (2000; treated as *Pyramica nepalensis*).

Natural history. *Strumigenys nepalensis* has been collected from leaf litter in rain forest, secondary forest, limestone forest and rubber plantations, and little is known about its bionomics.

Strumigenys rallarhina Bolton, 2000

Figure 33

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.272°E), Secondary forest, 05.vi.2013, 121 workers, 550m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 34 workers, 552m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 35 workers, 581m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.916°N, 101.274°E), Secondary forest, 08.vi.2013, 7 workers, 615m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Secondary forest, 08.vi.2013, 44 workers, 625m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 10.vi.2013, 22 workers, 830m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.961°N, 101.200°E), Rain forest, 10.vi.2013, 15 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.960°N, 101.199°E), Rain forest, 10.vi.2013, 26 workers, 840m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 9 workers, 805m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.964°N, 101.202°E), Rain forest, 13.vi.2013, 16 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from Yunnan (new record), Guangxi and Vietnam (Figure 33C).

Taxonomic note. *Strumigenys rallarhina* can be identified with the identification key provided by Bolton (2000).

Natural history. *Strumigenys rallarhina* has been collected from leaf litter in rain forest and secondary forest, and little is known about its bionomics.

Strumigenys sauteri (Forel, 1912)

Figure 34

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 10 workers, 581m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Secondary forest, 08.vi.2013, 3 workers, 625m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.962°N, 101.200°E), Rain forest, 13.vi.2013, 9 workers, 805m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.201°E), Rain forest, 13.vi.2013, 3 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

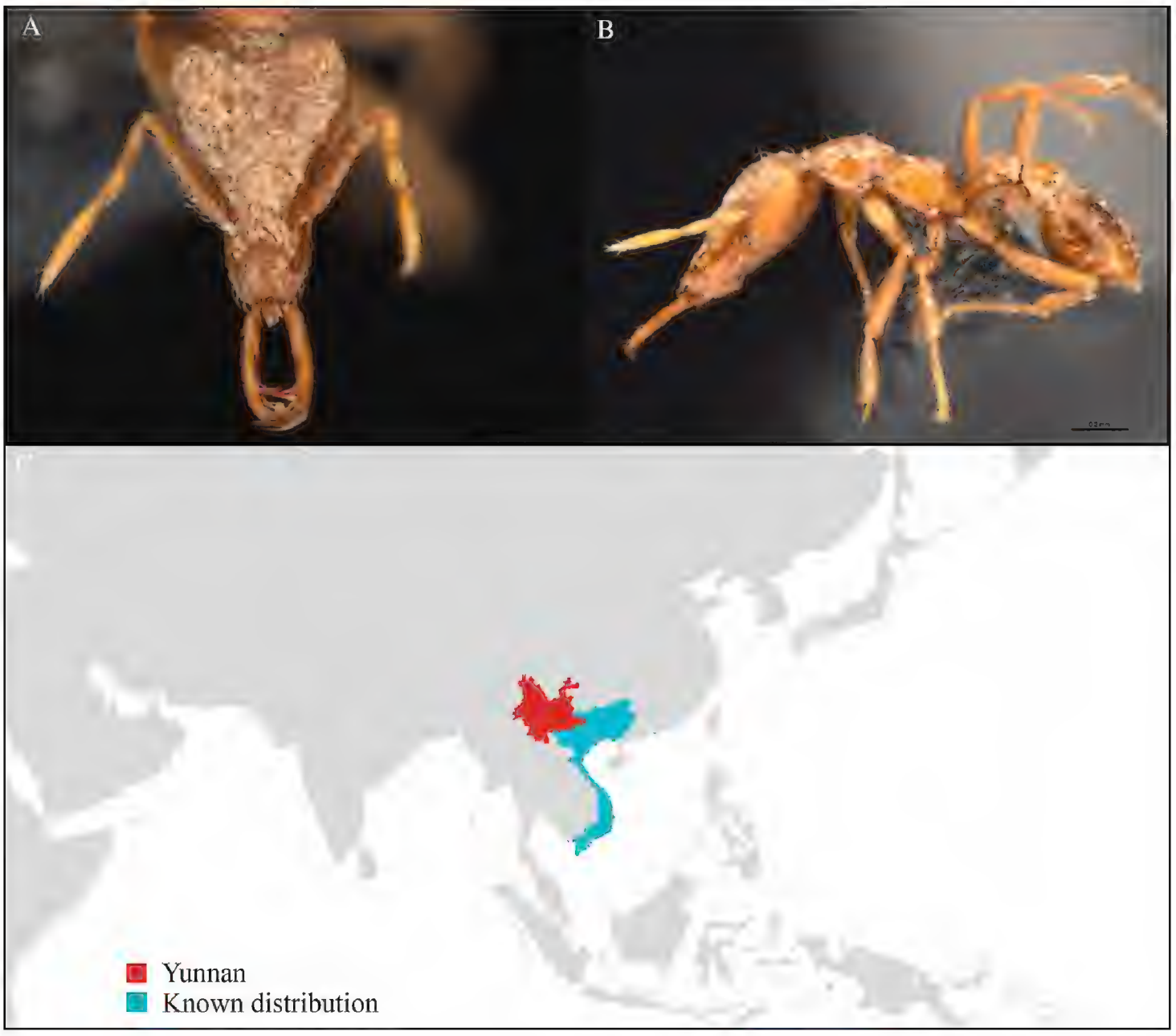

Figure 34. *Strumigenys sauteri* worker, CASENT0717023. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Widely distributed in Indo-Malayan subregions (Figure 34C).

Taxonomic note. *Strumigenys sauteri* can be identified with the identification key given by Bolton (2000; treated as *Pyramica sauteri*).

Natural history. *Strumigenys sauteri* has been collected from leaf litter in rain forest and secondary forest, and little is known about its bionomics.

Technomyrmex pratensis (Smith, 1860)

Figure 35

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 4 workers, 581 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.274°E), Secondary forest, 11.vi.2013, 4 workers, 590 m, Hand collection, B. Guénard, B. Blanchard and C. Liu.

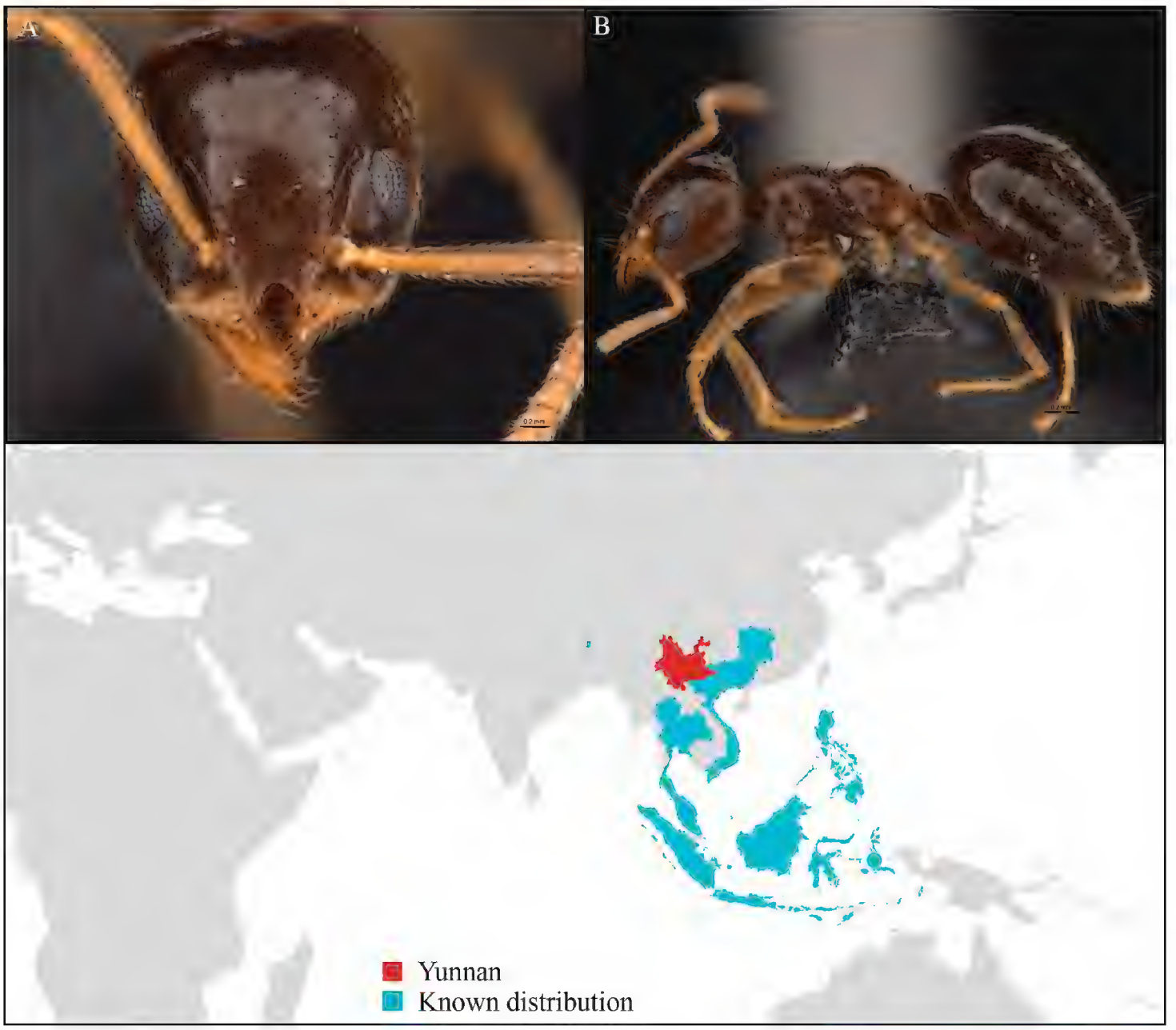

Figure 35. *Technomyrmex pratensis* worker, CASENT0715863. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Widely distributed in the Austral-Asian and Indo-Malayan subregions (Figure 35C).

Taxonomic note. *Technomyrmex pratensis* is the only member of the *Technomyrmex pratensis* species group. It is a very conspicuous species within the genus, and its identification is very easy with the key provided by Bolton (2007).

Natural history. *Technomyrmex pratensis* has been collected from leaf litter in secondary forest, and little is known about its bionomics.

Tetramorium difficile Bolton, 1977

Figure 36

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 2 workers, 552 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

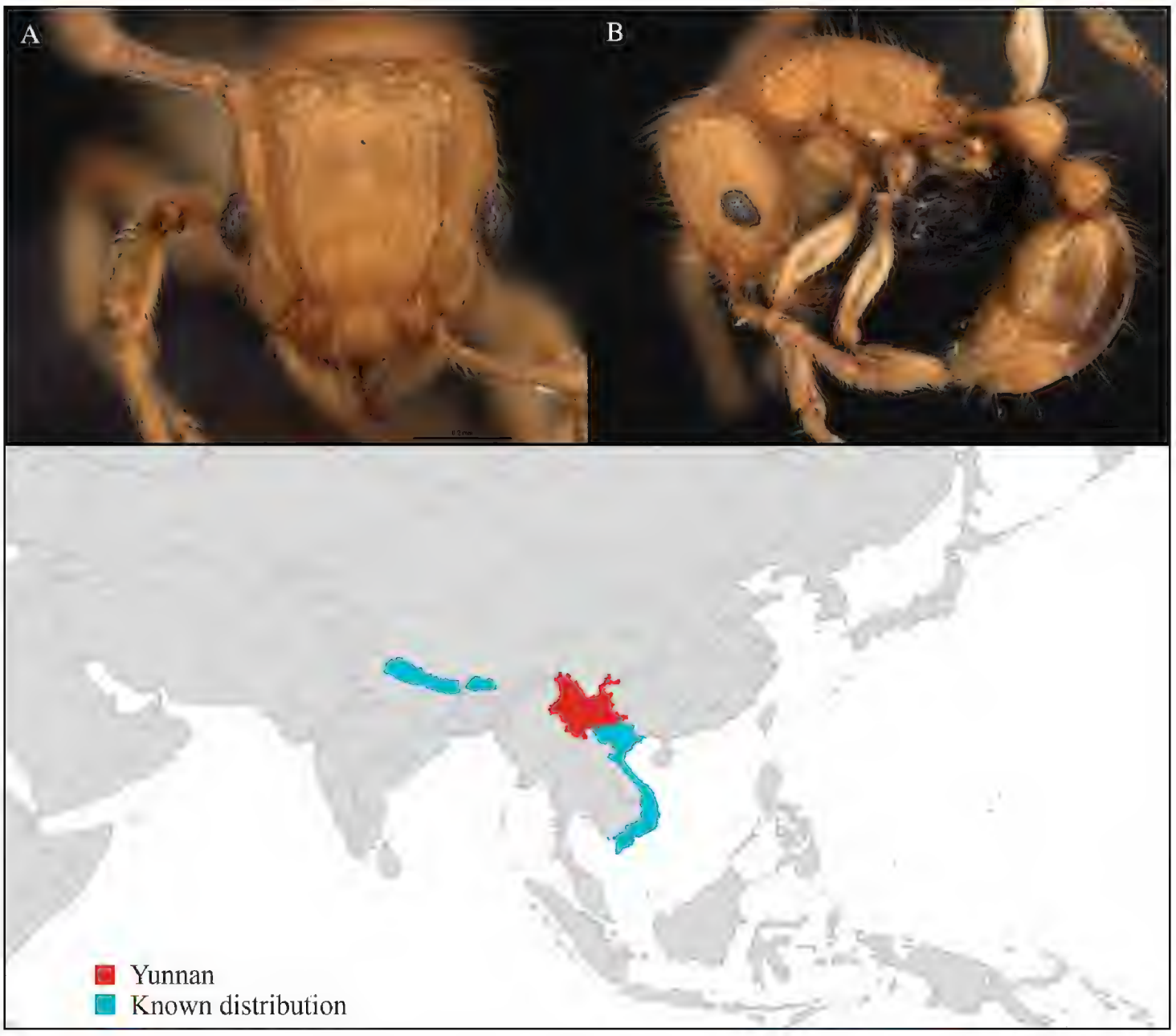

Figure 36. *Tetramorium difficile* worker, CASENT0713193. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Known form Yunnan (new record), northern India, and Vietnam (Figure 36C).

Taxonomic note. *Tetramorium difficile* is a member of the *Tetramorium tonganum* group and can be identified with the key provided by Bolton (1977). However, *T. difficile* under its current definition is morphologically very close to *T. tonganum*. It is likely that both are conspecific and the material listed as *T. difficile* represents intraspecific forms of the very widespread *T. tonganum*.

Natural history. *Tetramorium difficile* has been collected from leaf litter in secondary forest, and little is known about its bionomics.

Tetramorium flavipes Emery, 1893

Figure 37

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.918°N, 101.271°E), Secondary forest, 05.vi.2013, 35 workers, 552 m, Winkler sifting, B.

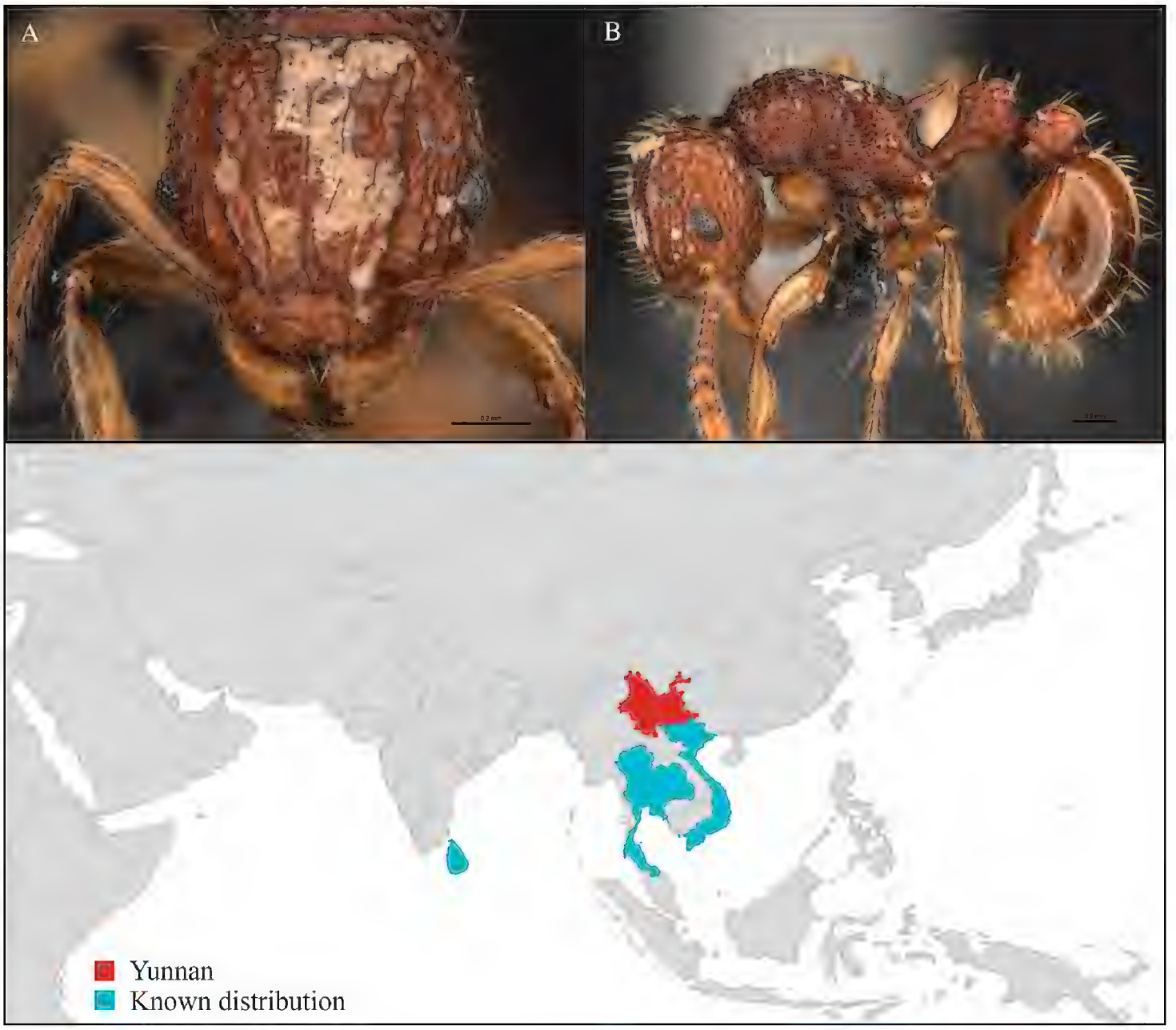

Figure 37. *Tetramorium flavipes* worker, CASENT0713761. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.274°E), Secondary forest, 08.vi.2013, 33 workers, 625 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.961°N, 101.201°E), Rain forest, 10.vi.2013, 8 workers, 820m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Kilometer 55 station (21.963°N, 101.200°E), Rain forest, 13.vi.2013, 5 workers, 815m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from Yunnan (new record), Vietnam, Thailand and Sri Lanka (Figure 37C). This new record represents the northern-most record in the distribution of this species.

Taxonomic note. *Tetramorium flavipes* is a member of the *Tetramorium tortuosum* group. Its identification is relatively straightforward with the key given by Bolton (1977). However, *T. flavipes*, originally described from Thailand, is very close to *T. eleates* Forel, 1913 from Borneo and the Philippines, and as already pointed out by Bolton (1977), both could represent geographic variants of the same species.

Natural history. *Tetramorium flavipes* has been collected from leaf litter in secondary forest, and very little is known about its bionomics.

Tetramorium parvispinum (Emery, 1893)

Figure 38

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 155 workers, 550 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.924°N, 101.268°E), Rubber plantation, 05.vi.2013, 6 workers, 571 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.917°N, 101.270°E), Secondary forest, 05.vi.2013, 7 workers, 580 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.911°N, 101.281°E), Limestone rain forest, 06.vi.2013, 155 workers, 650 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.916°N, 101.274°E), Secondary forest, 08.vi.2013, 58 workers, 615 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.930°N, 101.269°E), Rubber plantation, 09.vi.2013, 2 workers, 640 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.890°N, 101.267°E), Rubber plantation, 14.vi.2013, 9 workers, 620 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

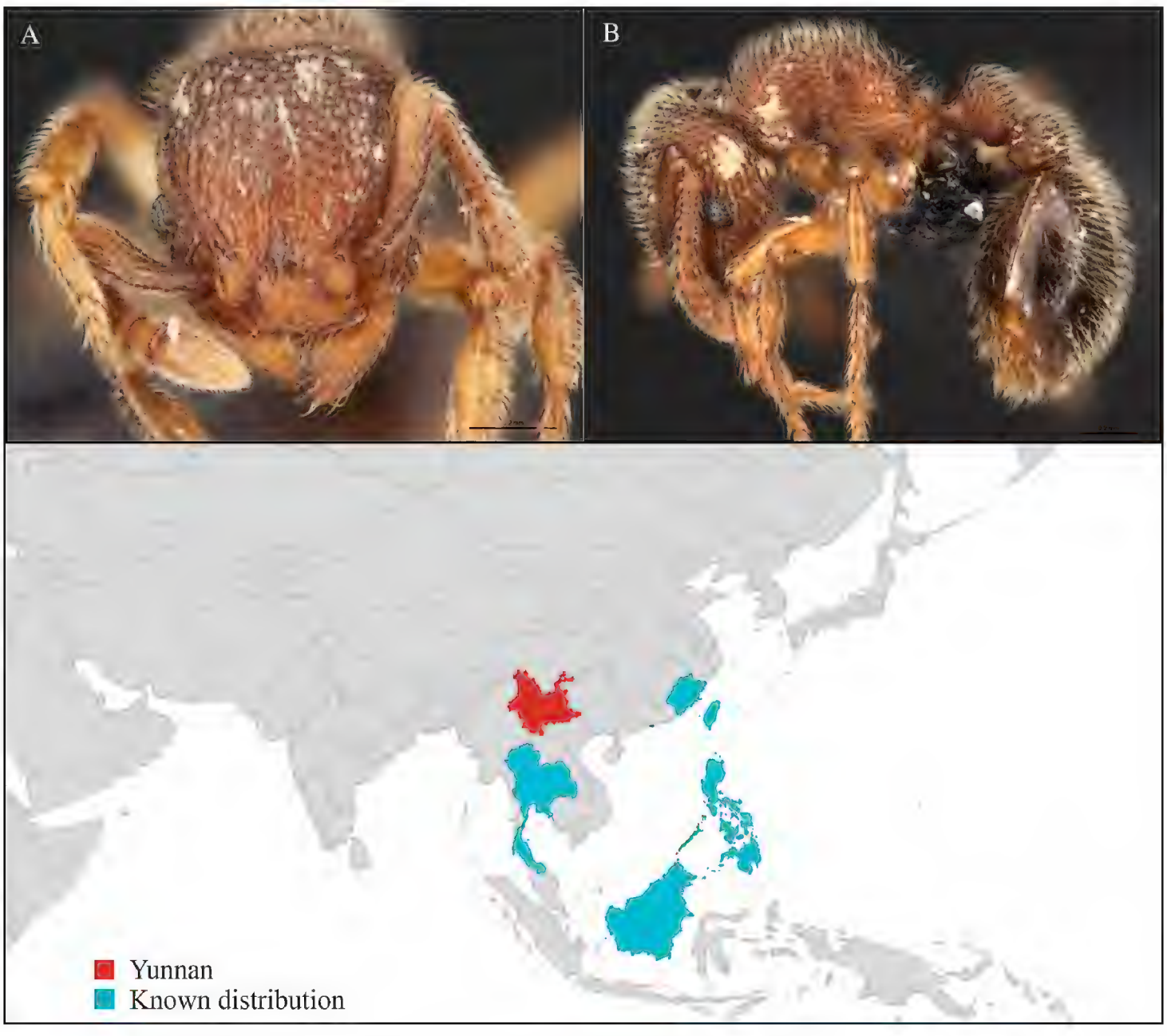

Figure 38. *Tetramorium parvispinum* worker, CASENT0735806. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

Distribution. Widely distributed in the Indo-Malayan subregion (Figure 38C).

Taxonomic note. *Tetramorium parvispinum* is a member of the *Tetramorium walshi* species group. It can be identified with the key presented by Bolton (1976; as *Triglyphothrix parvispina*)

Natural history. *Tetramorium parvispinum* has been collected from leaf litter in secondary forest, limestone forest and rubber plantations, and little is known about its bionomics.

Tetramorium polymorphum Yamane & Jaitrong, 2011

Figure 39

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.917°N, 101.274°E), Rain forest, 05.vi.2013, 1 major worker, 552 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.918°N, 101.270°E), Rain forest,

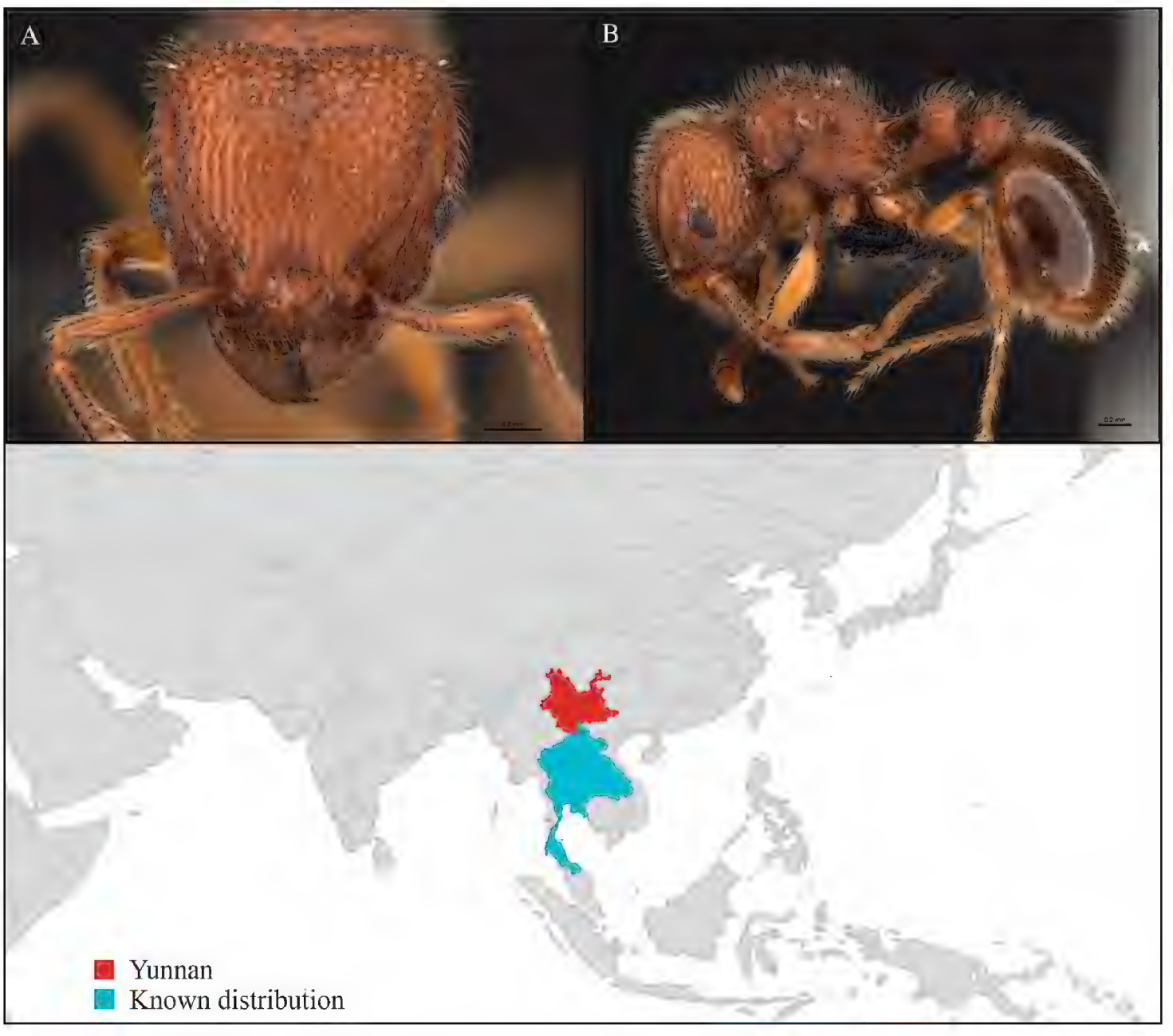

Figure 39. *Tetramorium polymorphum* worker, CASENT0713055. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

05.vi.2013, 3 workers, 581 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.919°N, 101.272°E), Rain forest, 05.vi.2013, 10 workers, 550 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; "Holy Hills" (21.920°N, 101.239°E), Rain forest, 07.vi.2013, 10 worker, 665m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; XTBG (21.928°N, 101.256°E), Rain forest, 07.vi.2013, 10 workers, 565 m, Hand collection, B. Guénard, B. Blanchard and C. Liu; Man Sai village (21.860°N, 101.278°E), Rain forest, 12.vi.2013, 1 worker, 680 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. Known from Yunnan (new record), Laos and Thailand (Figure 39C). This new record represents the northern-most record in the distribution of *Tetramorium polymorphum*.

Taxonomic note. *Tetramorium polymorphum* is a member of the *T. walshi* species group. Its identification is not easy since the species was not known when Bolton (1976) published his revision of the genus *Triglyphothrix* (now Tetramorium), in which he provided keys to the Indo-Malayan and Austral-Asian *T. walshi* and *T. obesum* species groups. However, by combining Bolton's (1976) work with the recent species description of Yamane and Jaitrong (2011) the identification is relatively straightforward. It is very similar to the closely related and sympatric *T. kheperra* Bolton, 1976, and the identification key of Bolton (1976) will lead the user to that species. The recent addition to Bolton's key provided by Yamane and Jaitrong (2011) clearly separates both species.

Natural history. *Tetramorium polymorphum* is a very special member of the genus *Tetramorium* since it is the only known species that possesses a polymorphic worker caste divisible into distinctive minor, media and major workers (Yamane and Jaitrong 2011). Yamane and Jaitrong (2011) also report that this species is comparatively aggressive and hypothesize that the major worker could have a defensive function. In addition, they emphasize that *T. polymorphum* is only found in undisturbed rain forest habitats in Thailand and Laos. Our data from Yunnan supports this since it was predominantly sampled from rain forest.

Tetramorium tonganum Mayr, 1870

Figure 40

Material examined. CHINA, Yunnan, Xishuangbanna: XTBG (21.919°N, 101.274°E), Secondary forest, 05.vi.2013, 9 workers, 552 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu; Menglun town (21.934°N, 101.269°E), Secondary forest, 09.vi.2013, 2 workers, 640 m, Winkler sifting, B. Guénard, B. Blanchard and C. Liu.

Distribution. *Tetramorium tonganum* is widely distributed in the Austral-Asian and Indo-Malayan subregions where it ranges from western Oceania to South East Asia (Figure 40C). Bolton (1977) has noted already that the species is widespread

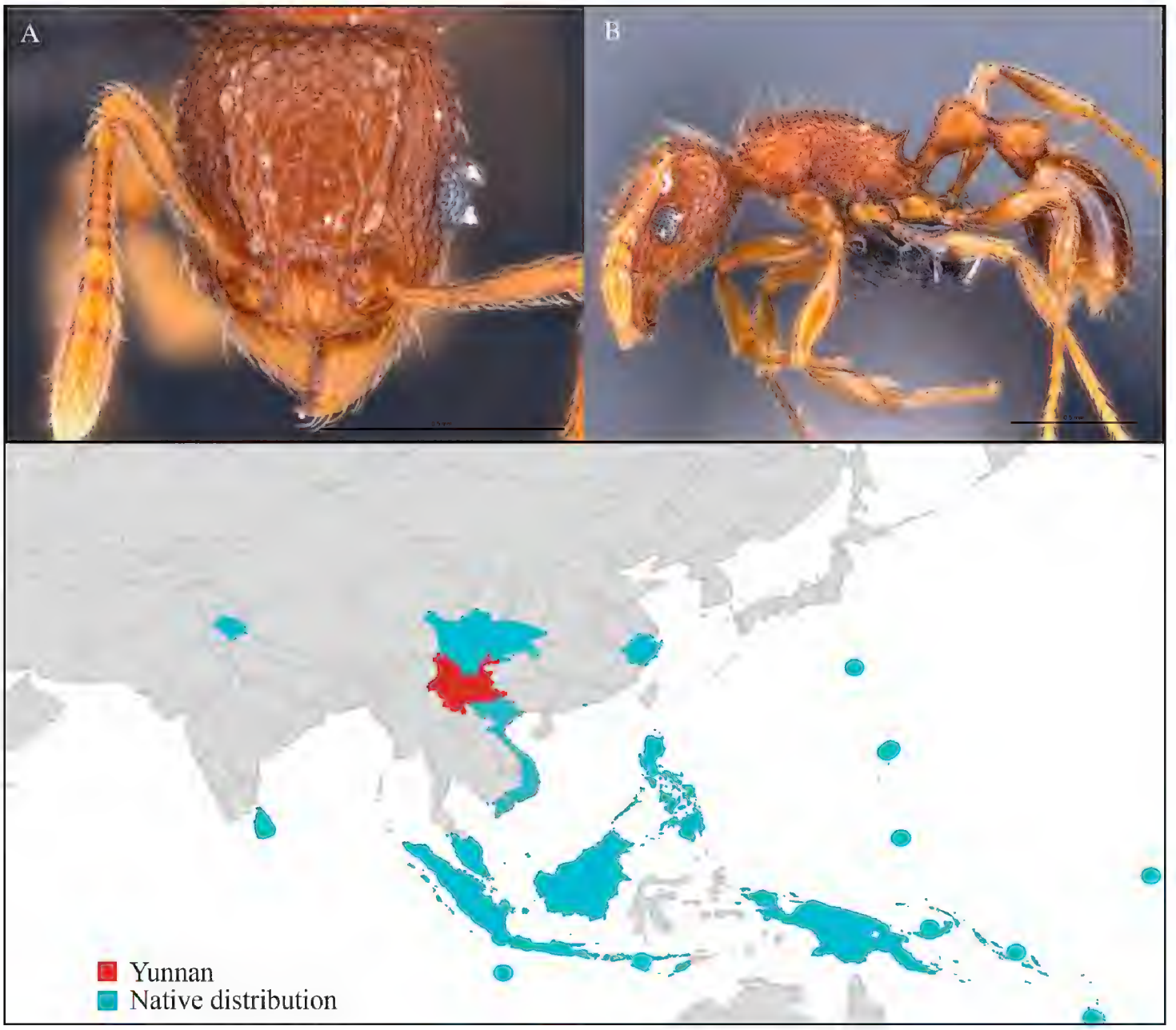

Figure 40. *Tetramorium tonganum* worker, CASENT0713454. **A** Head in front view **B** Mesosoma in profile view **C** Global distribution map.

in its native range and has the characteristics of tramp species. It is very likely that future collections will reveal its presence in more Chinese provinces Southeast Asian countries.

Taxonomic note. *Tetramorium polymorphum* belongs to the *Tetramorium tonganum* group and can be easily identified with the key provided by Bolton (1977).

Natural history. *Tetramorium polymorphum* has been collected from leaf litter in secondary forest, and is known to be an exotic species in China (Guenard and Dunn 2012). Despite its wide distribution and tramping ability, there is very little information about its biology. In addition to Bolton (1977), Sarnat and Economo (2012) also confirm that *T. tonganum* is able to establish populations outside its native range without damaging or significantly altering ecological or agricultural systems in its introduced habitats. They also report that *T. tonganum* is mostly found on vegetation in disturbed or edge habitats.

Discussion

The total number of named ant species in China is 939, but the true species richness is expected to be significantly higher, perhaps as high as 1200 to 1600 species (Guénard and Dunn 2012). The collection of these 40 new ant records for Yunnan and 17 for China through Winkler extraction, combined with the discovery of the extremely rare ant species *Bannapone scrobiceps* (Guenard et al. 2013), should encourage myrmecologists to consider leaf litter extraction as one of the primary methods to collect leaf litter ants, especially for places where this method has not previously been used. Nevertheless, further sampling methods that specifically target different strata will very likely yield additional species, which is especially true for hypogaeic and arboreal ant communities.

Based on our collections, many newly recorded species, such as *Discothyrea clavicornis*, *Myrmecina curvispina,* and *Odontoponera denticulata* are relatively common. The reason why those species were never reported from Yunnan before may be due to different collection techniques and/or misidentifications. For example, *Odontoponera denticulata* has long been misidentified as *Odontoponera transversa* (Yamane 2009). Another reason may be that some of the newly recorded species have been described only recently outside of Yunnan and/or China, such as *Myrmecina curvispina* and *Pheidole tumida* (Zhou et al. 2008, Eguchi 2008).

Many new species records in our collection such as *Aenictus artipus*, *A. maneerati*, *A. paradentatus*, *Discothyrea clavicornis*, *Dolichoderus laotius*, *Gesomyrmex kalshoveni*, *Gnamptogenys treta*, *Pheidole plagiaria*, *P. planifrons*, *P. rugithorax*, *P. tumida*, *P. vieti*, *Recurvidris kemneri*, *Strumigenys dyschima*, *S. mitis*, *Tetramorium difficile*, *T. flavipes*, *T. parvispinum*, and *T. tonganum*, are at the northern limit of their known distribution in Yunnan. Interestingly, the occurrence of several species in Yunnan, such as *Discothyrea clavicornis*, *Gesomyrmex kalshoveni*, *Gnamptogenys treta*, *Recurvidris kemneri*, and *Strumigenys dyschima* constitutes a disjunction from the rest of their known distribution in the Malay Peninsula. At present, it is unclear if these represent sampling artifacts and the ranges are actually continuous in the region, if these species ranges represent true biogeographic disjunctions, or if they are actually different species. Only future diversity inventories and taxonomic treatments, of which this paper represents one modest contribution, can answer these questions and further resolve the biodiversity map for ants and other organisms.

Despite the comparatively short collecting time we invested in the inventory of the myrmecofauna, we were able to identify 145 species, of which over 30% represent new records. This increases the list of known species for Yunnan by 10%, and there are still more than 60 species that we tentatively consider undescribed. This shows how little was previously known about the ant fauna of the region, and we are convinced that more intensive sampling in different habitats and microhabitats will likely reveal the presence of even more species or help improve the current taxonomic resolution. In this context, we think that Yunnan should be considered an area of high biodiversity value and deserving of attention of both biologists and conservationists. Regrettably, this interesting biota is being degraded at an alarming speed, particularly due to the rapid expansion of rubber plantations in the area (Li et al. 2007).

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